~~NORTH ATLANTIC~~

NORTHERN RIGHT WHALE (*Eubalaena glacialis*): Western Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Individuals of the western ~~North~~ Atlantic northern right whale population range from wintering and calving grounds in coastal waters of the southeastern United States to summer feeding and nursery grounds in New England waters and northward to the Bay of Fundy and the Scotian Shelf. Knowlton *et al.* (1992) reported several long-distance movements as far north as Newfoundland, the Labrador Basin, and southeast of Greenland; in addition, recent resightings of photographically identified individuals have been made off Iceland, arctic Norway and in the old Cape Farewell whaling ground east of Greenland. The Norwegian sighting (in September 1999) represents one of only two published sightings this century of a right whale in Norwegian waters, and the first since 1926. Together, these long-range matches indicate an extended range for at least some individuals and perhaps the existence of important habitat areas not presently well described. Similarly, records from the Gulf of Mexico (Moore and Clark 1963, Schmidly *et al.* 1972) represent either geographic anomalies or a more extensive historic range beyond the sole known calving and wintering ground in the waters of the southeastern United States. Whatever the case, the location of most of the population is unknown during the winter. Offshore (greater than 30 miles) surveys flown off the coast of northeastern Florida and southeastern Georgia from 1996 to 2001 had 3 sightings in 1996, 1 in 1997, 13 in 1998, 6 in 1999, 11 in 2000 and 6 in 2001 (within each year, some were repeat sightings of previously recorded individuals). The frequency with which right whales occur in offshore waters in the southeastern U.S. remains unclear.

Research results ~~to date~~ suggest that the existence of 6 major habitats or congregation areas for western ~~North~~ Atlantic northern right whales; these are the coastal waters of the southeastern United States, the Great South Channel, Georges Bank/Gulf of Maine, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Scotian Shelf. However, movements within and between habitats may be more extensive than is sometimes thought. Results from satellite tags clearly indicate that sightings separated by perhaps two weeks should not necessarily be assumed to indicate a stationary or resident animal. Instead, telemetry data have shown rather lengthy and somewhat distant excursions, including into deep water off the continental shelf (Mate *et al.* 1997). Systematic surveys conducted ~~for the first time~~ off the coast of North Carolina ~~in winter~~during the winters of 2001 and 2002 sighted 8 calves, suggesting the calving grounds may extend as far north as Cape Fear. Four of the calves were not sighted by surveys conducted further south. One of the cows photographed was new to researchers, having effectively eluded identification over the period of its maturation (McLellan *et al.* 2004). The Northeast Fisheries Science Center is conducting an extensive multi-year aerial survey program throughout the Gulf of Maine region; this program is intended to better establish the distribution of right whales, including inter-annual variability in their occurrence in previously poorly studied habitats.

New England waters are a primary feeding habitat for the right whale, which appears to feed primarily on copepods (largely of the genera *Calanus* and *Pseudocalanus*) in this area. Research suggests that right whales must locate and exploit extremely dense patches of zooplankton to feed efficiently (Mayo and Marx 1990). These dense zooplankton patches are likely a primary characteristic of the spring, summer, and fall right whale habitats (Kenney *et al.* 1986, 1995). Acceptable surface copepod resources are limited to perhaps 3% of the region during the peak feeding season in Cape Cod and Massachusetts Bays (C. Mayo pers. comm.). While feeding in the coastal waters off Massachusetts has been better studied than in most areas, feeding by right whales has also been observed on the margins of Georges Bank, in the Gulf of Maine, in the Bay of Fundy, and over the Scotian Shelf. The characteristics of acceptable prey distribution in these areas are not well known. In addition, New England waters serve as a nursery for calves~~ and perhaps also as a mating ground~~. ~~NOAA Fisheries~~ NMFS (National Marine Fisheries Service) and Center for Coastal Studies aerial surveys ~~in the spring~~during springs of 1999~~, 2000, 2001 and~~ -2002 found ~~substantial numbers of~~ right whales along the Northern Edge of Georges Bank, in Georges Basin, and in various locations in the Gulf of Maine including Cashes Ledge, Platts Bank and Wilkinson Basin. The predictability with which right whales occur in such locations remains unclear, and these new data highlight the need for more extensive surveys of habitats ~~which~~that have previously received minimal coverage.

Genetic analyses based upon direct sequencing of mitochondrial DNA (mtDNA) have identified five mtDNA haplotypes in the western ~~North~~ Atlantic ~~population~~northern right whale (Malik *et al.* 1999). Schaeff *et al.* (1997) compared the genetic variability of North Atlantic and southern right whales (*E. australis*), and found the former to be significantly less diverse, a finding broadly replicated from sequence data by Malik *et al.* (2000). These findings might be indicative of inbreeding in the population, but no definitive conclusion can be reached using current data. Additional work comparing modern and historic genetic population structure in right whales, using DNA extracted from museum and archaeological specimens of baleen and bone, is also underway (Rosenbaum *et al.* 1997, 2000). Preliminary results suggest that the eastern and western North Atlantic populations were not genetically distinct (Rosenbaum *et al.* 2000). However, the virtual extirpation of the eastern stock and its lack of recovery in the last hundred years strongly suggests population subdivision over a protracted (but not evolutionary) timescale. Results also suggest that, as expected, the principal loss of genetic diversity occurred during major exploitation events prior to the 20th century.

To date, skin biopsy sampling has resulted in the compilation of a DNA library of almost 300 North Atlantic right whales. When work is completed, a genetic profile will be established for each individual, and an assessment provided on the level of genetic variation in the population, the number of reproductively active individuals, reproductive fitness, the basis for associations and social units in each habitat area, and the mating system. Tissue analysis has also aided in sex identification: the sex ratio of the photo-identified and catalogued population does not differ significantly from parity. Analyses based on both genetics and sighting histories of photographically identified individuals also suggest that in this stock approximately one-third of the females with calves ~~population utilizes~~uses~~s~~ summer feeding grounds other than the Bay of Fundy (New England Aquarium, unpub~~.~~lished data). As described above, a related question is where individuals other than calving females and a few juveniles overwinter. One or more additional wintering and summering grounds may exist in unsurveyed locations, although it is also possible that ~~"~~missing~~"~~ animals simply disperse over a wide area at these times. Identification of such areas, and the possible threats to right whales there, is recognized as a priority for research efforts.

POPULATION SIZE

Based on a census of individual whales identified using photo-identification techniques ~~combined with the~~ and an assumption of mortality of whales not seen ~~for 7~~in seven years, the western North Atlantic ~~population~~stock size was estimated to be 295 individuals in 1992 (Knowlton *et al.* 1994); an updated analysis using the same method gave an estimate of 299 animals in 1998 (Kraus *et al.* 2001). ~~Because this was a nearly complete census, it is assumed that this represents a minimum population size estimate. However, no estimate of abundance with an associated coefficient of variation has been calculated for this population. Calculation of a reliable point estimate is likely to be difficult given the known problem of heterogeneity of distribution in this population.~~ An IWC workshop on status and trends of western North Atlantic right whales gave a minimum direct-count estimate of 263 right whales alive in 1996 and noted that the true population was unlikely to be substantially greater than this (Best *et al.* 2001). In a review of the photo-id recapture database for October 2005, 306 individually recognized whales were known to be alive during 2001. Because this was a nearly complete census, it is assumed that this represents a minimum population size, and no estimate of abundance with an associated coefficient of variation has been calculated for this population.

Historical Abundance

An estimate of pre-exploitation population size is not available. Basque whalers may have taken substantial numbers of right whales at times during the 1500's in the Strait of Belle Isle region (Aguilar 1986), and the stock of right whales may have already been substantially reduced by the time whaling was begun by colonists in the Plymouth area in the 1600's (Reeves and Mitchell 1987). A modest but persistent whaling effort along the coast of the eastern U.S. lasted three centuries, and the records include one report of 29 whales killed in Cape Cod Bay in a single day during January 1700. Based on incomplete historical whaling data, Reeves and Mitchell (1987) could conclude only that there were at least some hundreds of right whales present in the western North Atlantic during the late 1600's. In a later study (Reeves *et al.* 1992), a series of population trajectories using historical data and an estimated present population size of 350 were plotted. The results suggest that there may have been at least 1,000 right whales in this population during the early to mid-1600's, with the greatest population decline occurring in the early 1700's. The authors cautioned, however, that the record of removals is incomplete, the results were preliminary, and refinements are required. Based on back calculations using the present population size and growth rate, the population may have numbered fewer than 100 individuals by the time international protection for right whales came into effect in 1935 (Hain 1975, Reeves *et al.* 1992, Kenney *et al.* 1995). However, too little is known about the population dynamics of right whales in the intervening years to state anything with confidence.

Minimum Population Estimate

The western North Atlantic population size was ~~estimated~~known to be ~~299~~at least 306 individuals in ~~1998 (Kraus~~

et al. 2001~~),~~ based on a census of individual whales identified using photo-identification techniques. ~~A bias~~ This value is a minimum and does not include animals that ~~might result from including catalogued whales that had not been~~were alive prior to 2001, but not recorded in the catalogue as seen ~~for an extended period of time and therefore might~~during 2001-2004. It also does not include any calves known to be ~~dead, was addressed by assuming that an individual whale not sighted for five or more years was dead (Knowlton~~ *et al.* ~~1994). It is assumed that the census of identified and presumed living whales represents a minimum population size estimate. The true population size in 1998 may have been higher if: 1) there were animals not photographed and identified, and/or 2) some~~born during 2001, but not entered as new animals ~~presumed dead were not.~~
in the catalog.

Current Population Trend

The population growth rate reported for the period 1986-1992 by Knowlton *et al.* (1994) was 2.5% (CV=0.12), suggesting that the stock was showing signs of slow recovery. However, work by Caswell *et al.* (1999) has suggested that crude survival probability declined from about 0.99 in the early 1980's to about 0.94 in the late 1990's. The decline was statistically significant. Additional work conducted in 1999 was reviewed by the IWC workshop on status and trends in this population (Best *et al.* 2001); the workshop concluded based on several analytical approaches that survival had indeed declined in the 1990's. Although capture heterogeneity ~~of capture~~ could negatively bias survival estimates, the workshop concluded that this factor could not account for ~~all of~~ the entire observed decline, which appeared to be particularly marked in adult females. Another workshop was convened by N~~OAA Fisheries~~ MFS in September 2002, and after reviewing several approaches to survival estimation reached similar conclusions regarding the decline in this population (Clapham 2002).

Recent mortalities, including those in the first half of 2005, represent an increase in annual mortality rate (Kraus *et al.* 2005), and calculations based on demographic data through 1999 (Fujiwara and Caswell 2001) indicate that this mortality rate increase would reduce population growth by approximately 10% per year (Kraus *et al.* 2005). Of these recorded deaths six were adult females, three of which were carrying near-term fetuses. Furthermore, four of these females were just starting to bear calves, and since the average lifetime calf production is 5.25 calves (Fujiwara and Caswell 2001), the deaths of these females represent a lost reproductive potential of as many as 21 animals.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

During 1980-1992, 145 calves were born to 65 identified cows. The number of calves born annually ranged from 5 to 17, with a mean of 11.2 (SE=0.90). The reproductively active female pool was static at approximately 51 individuals during 1987-1992. Mean calving interval, based on 86 records, was 3.67 years. There was an indication that calving intervals may have been increasing over time, although the trend was not statistically significant (P=0.083) (Knowlton *et al.* 1994).

Since that report, total reported calf production in 92/93 was 8; 93/94, 9; 94/95, 7; 95/96, ~~24~~22; 96/97, 20; 97/98, 6; 98/99, 4; 99/00, 1; 00/01, 31; 01/02, ~~24; and~~ 21; 02/03, 19; 03/04, 17 and 04/05, 28 [mean ~~13.6~~14.8 SE=2.~~9~~7)]. However, this total calf production should be reduced by reported calf mortalities: 2 mortalities in 1993, 3 in 1996, 1 in 1997, 1 in 1998, 4 in 2001 and 2 in 2002. During 2002, 2 mortalities and 1 serious injury involved what were likely calves from 00/01. Of the three calf mortalities in 1996, available data suggested one was not included in the reported ~~24~~22 mother/calf pairs, resulting in a total of ~~25~~23 calves born. Eleven of the ~~21~~22 mothers in 1996 were observed with calves for the first time (i.e., were "new" mothers) that year. Three of these were at least 10 years old, 2 were 9 years old, and 6 were of unknown age. An updated analysis of calving interval through the 1997/1998 season suggests that mean calving interval increased since 1992 from 3.67 years to more than 5 years, a significant trend (Kraus *et al.* 2001). This conclusion is supported by modeling work reviewed by the IWC workshop on status and trends in this population (Best *et al.* 2001); the workshop agreed that calving intervals had indeed increased and further that the reproductive rate was approximately half that reported from studied populations of *E. australis*. ~~The low calf production in subsequent years (4 in 1999 and only 1 in 2000) gives added cause for concern, although a record 31 calves were born in 2001.~~ A workshop on possible causes of reproductive failure was held in April 2000 (Reeves *et al.* 2001). Factors considered included contaminants, biotoxins, nutrition/food limitation, disease and inbreeding problems. While no conclusions were reached, a research plan to further investigate this topic was developed.

The annual population growth rate during 1986-1992 was estimated to be 2.5% (CV=0.12) using photo-identification techniques (Knowlton *et al.* 1994). A population increase rate of 3.8% was estimated from the annual increase in aerial sighting rates in the Great South Channel, 1979-1989 (Kenney *et al.* 1995). However, as noted above, more recent work indicated that the population was in decline in the 1990's (Caswell *et al.* 1999, Best *et al.* 2001).

An analysis of the age structure of this population suggests that it contains a smaller proportion of juvenile whales than expected (Hamilton *et al.* 1998a, Best *et al.* 2001), which may reflect lowered recruitment and/or high juvenile mortality. In addition, it is possible that the apparently low reproductive rate is due in part to unstable age structure or to reproductive senescence on the part of some females. However, data on either factor are poor; senescence has been demonstrated in relatively few mammals (including humans, pilot whales, and killer whales) and is currently undocumented for any baleen whale.

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) is specified as the product of minimum population size, one-half the maximum net productivity rate and a "recovery" factor for endangered, depleted, threatened stocks, or stocks of unknown status relative to OSP (MMPA Sec. 3. 16 U.S.C. 1362, Wade and Angliss 1997). The recovery factor for right whales is 0.10 because this species is listed as endangered under the Endangered Species Act (ESA). However, in view of the population decline indicated by recent demographic analyses (Caswell *et al.* 1999, Best *et al.* 2001), the PBR for this population is set to zero.

ANNUAL HUMAN-CAUSED SERIOUS INJURY AND MORTALITY

For the period ~~1999~~2000 through ~~2003~~2004, the total estimated human-caused mortality and serious injury to right whales is estimated at ~~3.~~2.8 per year (U.S. waters, ~~2.0~~1.6; Canadian waters, 1.2). This is derived from two components: 1) non-observed fishery entanglement records at ~~2.2~~1.6 per year (U.S. waters, ~~1.4~~0.6; Canadian waters, 1.0~~.8~~), and 2) ship strike records at 1.~~0~~2 per year (U.S. waters, 1.0~~.8~~; Canadian waters, 0.2). ~~Note that in the 1996 and 1998 stock assessment reports, a six-year time frame was used to calculate these averages. A five-year period has since been used to be consistent with the time frames used for calculating the averages for other species.~~ Beginning with the 2001 Stock Assessment Report, Canadian records were incorporated into the mortality and serious injury rates of this report to reflect the effective range of this stock. It is also important to stress that serious injury determinations are made based upon the best available information; these determinations may change with the availability of new information (Cole *et al.* 2005). For the purposes of this report, discussion is primarily limited to those records considered confirmed human-caused mortalities or serious injuries.

Background

The details of a particular mortality or serious injury record often require a degree of interpretation. The assigned cause is based on the best judgment of the available data; additional information may result in revisions. When reviewing Table 1 below, several factors should be considered: 1) a ship strike or entanglement may occur at some distance from the reported location; 2) the mortality or injury may involve multiple factors; for example, whales that have been both ship struck and entangled are not uncommon; 3) the actual vessel or gear type/source is often uncertain; and 4) in entanglements, several types of gear may be involved.

The serious injury determinations are most susceptible to revision. There are several records where a struck and injured whale was re-sighted later, apparently healthy, or where an entangled or partially disentangled whale was re-sighted later free of gear. The reverse may also be true: a whale initially appearing in good condition after being struck or entangled is later re-sighted and found to have been seriously injured by the event. Entanglements of juvenile whales are typically considered serious injuries because the constriction on the animal is likely to become increasingly harmful as the whale grows.

~~"Serious~~A serious injury~~"~~ was defined in 50 CFR part 229.2 as an injury that was likely to lead to mortality. We therefore limited the serious injury designation to only those reports that had substantiated evidence that the injury, whether from entanglement or vessel collision, was likely to lead to the whale's death. Determinations of serious injury were made on a case~~-~~-by~~-~~-case basis following recommendations from the workshop conducted in 1997 on differentiating serious and non-serious injuries (Angliss and DeMaster 1998). Injuries that impeded the whale's locomotion or feeding were not considered serious injuries unless they were likely to be fatal in the foreseeable future. There was no forecasting of how the entanglement or injury may increase the whale's susceptibility to further injury, namely from additional entanglements or vessel collisions. This conservative approach likely underestimates serious injury rates.

With these caveats, the total estimated annual average human-induced mortality and serious injury incurred by this stock (including fishery and non-fishery related causes) was ~~3.~~2.8 right whales per year (U.S. waters ~~2.2~~1.6; Canadian waters, 1.~~0~~2). As with entanglements, some injury or mortality due to ship strikes almost certainly passes undetected, particularly in offshore waters. Decomposed and/or unexamined animals (e.g., carcasses reported but not retrieved or necropsied) represent ~~"~~lost data~~"~~, some of which may relate to human impacts. For these reasons, the figure of ~~3.~~2.8 right whales per year must be regarded as a minimum estimate.

Further, the small population size and low annual reproductive rate suggest that human sources of mortality may have a greater effect relative to population growth rates than for other whales. The principal factors believed to be retarding growth and recovery of the population are ship strikes and entanglement with fishing gear. Between 1970 and 1999, a total of 45 right whale mortalities were recorded (IWC 1999, Knowlton and Kraus 2001). Of these, 13 (28.9%) were neonates that are believed to have died from perinatal complications or other natural causes. Of the remainder, 16 (35.6%) were determined to be the result of ship strikes, 3 (6.7%) were related to entanglement in fishing gear (in two cases lobster gear, and one gillnet gear), and 13 (28.9%) were of unknown cause. At a minimum, therefore, 42.2% of the observed total for the period~~,~~ and 50% of the 32 non-calf deaths~~,~~ were attributable to human impacts (calves accounted for three deaths from ship strike).

Young animals, ages 0-4 years, are apparently the most impacted portion of the population (Kraus 1990). Finally, entanglement or minor vessel collisions may not kill an animal directly, but may weaken or otherwise affect it so that it is more likely to become vulnerable to further injury. Such was apparently the case with the two-year-old right whale killed by a ship off Amelia Island, Florida, in March 1991 after having carried gillnet gear wrapped around its tail region since the previous summer (Kenney and Kraus 1993). A similar fate befell right whale #2220, found dead on Cape Cod in 1996.

~~For waters of the northeastern USA, a present concern not yet completely defined, is the possibility of habitat degradation in Massachusetts and Cape Cod Bays due to a Boston sewage outfall, which came on-line in September 2000.~~

Fishery-Related Serious Injury and Mortality

Reports of mortality and serious injury relative to PBR as well as total human impacts are contained in records maintained by the New England Aquarium and the ~~NOAA Fisheries~~NMFS Northeast and Southeast Regional Offices (Table 1). From ~~1999~~2000 through ~~2003, 11~~2004, 8 of ~~16~~14 records of mortality or serious injury (including records from both USA and Canadian waters) involved entanglement or fishery interactions. The reports often do not contain the detail necessary to assign the entanglements to a particular fishery or location. ~~Over time, however, additional sightings of entangled whales often provide the information needed.~~

Although disentanglement is either unsuccessful or not possible for the majority of cases, during the period ~~1999~~2000 through ~~2003~~2004, there were at least ~~six~~five documented cases of entanglements for which the intervention of disentanglement teams averted a likely serious injury determination. On ~~6/5/99~~7/9/00, #2746, a ~~two~~three-year-old ~~female, #2753~~of unknown gender, was ~~found with a line through the mouth and trailing a Norwegian ball and highflyer. The nature of the entanglement would likely not have allowed the whale to shed the gear, and over a prolonged period, the rope=s chafing likely would have caused systemic infection. Another two-year-old female, #2710, was sighted on 7/21/1999 wrapped in Canadian pot gear. A line passed through the mouth and around at least the right flipper. This entanglement would have become more constrictive as the whale grew. On 7/9/00, #2746, a three-year-old of unknown gender was~~ seen with a line running through either side of the mouth and bridled behind the blowholes, while another portion of the line pinned the left flipper to the whale~~=~~'s flank. A nine-year-old female, #2223, was sighted on 8/18/00 with line tightly wrapped across her back, running through the mouth, and possibly wrapped on the left flipper. Subsequent sightings prior to the disentanglement revealed that the line across the back was beginning to tighten. On 7/20/01, #2427, a seven-year-old male was sighted off Portsmouth, New Hampshire, with line wrapped tightly around the rostrum and through the mouth. The whale was disentangled later that day, and subsequent resightings indicated that the injuries were healing. However, observers also noted that the whale~~=~~'s baleen was damaged, and that the whale was holding its head high out of the water and not diving nearly as frequently as other whales in the area. ~~Lastly, an~~An unidentified right whale was disentangled off Campobello Island, Canada on 7/09/03. The gear was tentatively identified as US lobster gear and other unknown gear. And lastly, on 12/6/04 a one-year-old of unknown gender, #3314, was sighted with line wrapped on both its head and tail which would likely be fatal. Following more than three weeks of attempts, the constricting fishing gear was removed.

In January 1997, ~~NOAA Fisheries~~NMFS changed the classification of the Gulf of Maine and U.S. mid-Atlantic lobster pot fisheries from Category III to Category I based on examination of stranding and entanglement records of large whales from 1990 to 1994 (62 FR 33, Jan. 2, 1997).

Bycatch of a right whale has been observed by ~~NOAA Fisheries Sea Samplers~~the Northeast Fisheries Observer Program in the pelagic drift gillnet fishery, but no mortalities or serious injuries have been documented in any of the other fisheries monitored by ~~NOAA Fisheries~~NMFS. The only bycatch of a right whale documented by ~~NOAA~~ the Northeast Fisheries Observer Program~~Fisheries Sea Samplers~~ was a female released from a pelagic drift gillnet in 1993.

In a recent analysis of the scarification of right whales, a total of ~~61~~75.6% of ~~the~~447 whales ~~bore evidence of entanglements with~~ examined during 1980-2002 were scared at least once by fishing gear ~~(Hamilton~~(Knowlton *et al.* ~~1998b~~2005). Further research using the North Atlantic Right Whale Catalogue has indicated that, each year, between ~~10~~14% and ~~28~~51% of right whales are involved in entanglements (Knowlton *et al.* ~~2001~~2005). Entanglement records maintained by ~~NOAA Fisheries~~NMFS Northeast Regional Office (NOAA ~~Fisheries~~NMFS, unpublished data) from 1970 through ~~2000~~2004 included at least ~~72~~92 right whale entanglements or possible entanglements, including right whales in weirs, entangled in gillnets, and trailing line and buoys. An additional record (M. J. Harris, pers. comm.) reported a 9.1-10.6m right whale entangled and released south of Ft. Pierce, Florida, in March 1982 (this event occurred during a sampling program and was not related to a commercial fishery). Incidents of entanglements in groundfish gillnet gear, cod traps, and herring weirs in waters of Atlantic Canada and the U.S. east coast were summarized by Read (1994). In 6 records of right whales becoming entangled in groundfish gillnet gear in the Bay of Fundy and Gulf of Maine between 1975 and 1990, the right whales were either released or escaped on their own, although several whales have been observed carrying net or line fragments. A right whale mother and calf were released alive from a herring weir in the Bay of Fundy in 1976. For all areas, specific details of right whale entanglement in fishing gear are often lacking. When direct or indirect mortality occurs, some carcasses come ashore and are subsequently examined, or are reported as "floaters" at sea; however, the number of unreported and unexamined carcasses is unknown, but may be significant in the case of floaters. More information is needed about fisheries interactions and where they occur.

Other Mortality

Ship strikes are a major cause of mortality and injury to right whales (Kraus 1990, Knowlton and Kraus 2001). Records from ~~1999~~2000 through ~~2003~~2004 have been summarized in Table 1. For this time frame, the average reported mortality and serious injury to right whales due to ship strikes was 1.~~0~~2 whales per year (U.S. waters, 1.0~~.8~~; Canadian waters, 0.2). In ~~2004, two ships strike mortalities had been confirmed at the time of this writing. The first was found on 2/7/04 on Virginia Beach, VA, with major blunt trauma to the head and body. The second was reported struck by a troop transport ship off the Chesapaeke Bay entrance, and then seen again alive in the same area with a severed fluke on 11/17/04. It washed ashore dead on 11/24/04 in Ocean Sands, NC. Both of these events involved adult females carrying calves.~~ 2000, two right whales were sighted in the Bay of Fundy with large open wounds that were likely the result of collisions with vessels. Right whale #2820, a male of unknown age, was first seen injured on 7/9/00. He was sighted intermittently throughout the remainder of that summer, and was seen again in the Bay of Fundy in 2001. The second whale, #2660, is a five-year-old female who was sighted with a wound on the left side of her head, just forward of the blowholes. She has not been resighted since. Although both of these injuries have a gruesome appearance, in the absence of a chronic stressor (i.e., entangling fishing gear), they are ~~not~~ likely ~~to be~~ not fatal.

Table 1. Confirmed human-caused mortality and serious injury records of North Atlantic right whales, January ~~1999~~2000 through December ~~2003~~2004.

Date	Report Type	Sex, age, ID	Location	Assigned Cause: P=primary, S=secondary		Notes
				Ship strike	Entang./ Fsh inter	
~~4/20/99~~	~~mortality~~	~~27+ yr. old female #1014~~	~~Cape Cod, MA~~	~~P~~		~~Fractures to mandible and vertebral column, abrasion and edema around right flipper~~
~~5/10/99~~	~~mortality~~	~~Adult female #2030~~	~~80mi east of Cape Cod, MA~~		~~P~~	~~Constricting sink gillnet gear created deep, extensive lacerations~~

3/01/00	serious injury	Adult male #1130	6mi east of Manomet, MA		P	Line apparently constricting left flipper; flipper discolored; abnormal cyamid distribution; bullet buoy trailing, line weighted down between whale and buoy; no gear recovered
3/17/01	mortality	Male calf	Assateague, VA	P		Large fresh propeller gashes on dorsal caudal and acute muscular hemorrhage
6/8/01	serious injury	Adult male #1102	~~58~~58 mi east of Cape Cod, MA		P	Entangling gear deeply embedded; ~~whale showing~~ numerous signs of poor health including emaciation, skin discoloration, and abnormal cyamid distribution
6/18/01	mortality	female calf	Long Island, NY	P		Dorsal propeller wounds, sub-dermal hemorrhage
11/3/01	mortality	14 m Adult male #1238 ~~14 m~~	Magdellen Islands, Canada		P	Thoroughly wrapped up in gear, whale seen alive and well five months earlier
~~2/12~~7/6/02	~~serious injury~~mortality	~~Adult male #1424~~11 m female #3107	~~off Amelia~~Off Briar Island, ~~FL~~NS Canada		P	~~multiple tight wraps around rostrum (last resighted 4/14/03)~~carcass ashore on Nantucket, MA; caudal peduncle severely lacerated where entangled; consistent with inshore lobster gear
~~7/6/02~~	~~mortality~~	~~11.0m (est) female #3107~~	~~off Briar Island, NS Canada~~		~~P~~	~~carcass ashore on Nantucket, MA; caudal peduncle severely lacerated where entangled~~
~~7/12/02~~	~~serious injury~~	~~Adult female #1427~~	~~off Long Beach Island, NJ~~		~~P~~	~~line tightly wrapped around rostrum~~
~~8/4/02~~	~~serious injury~~	~~Adult female #2320~~	~~Bay of Fundy, Canada~~		~~P~~	~~multiple wraps on rostrum, one tight (last resighted 4/29/03)~~
8/22/02	serious injury	Adult female #1815	Scotian Shelf, Canada		P	line tightly wrapped around head and tail stock; no gear recovered
8/22/02	mortality	12.6m female 1"y.o.	off Ocean City, MD	P		large laceration on dorsal surface
8/30/02	serious injury	#3210 age & sex unknown	~~off Cape Cod, MA~~Bay of Fundy, NS		P	line tightly wrapped around rostrum, resighted in 2004 in poor condition; no gear recovered
1~~0/02~~/14/03	~~mortality~~ serious injury	Adult female ~~#2150~~ #2240	~~off Digby, NS~~Jacksonville, FL	~~P~~	P	~~Large fracture in skull, sub-dermal hemorrhage~~body condition poor, gear possibly ingested; no gear recovered
10/02/03	mortality	Adult female #2150	Digby, NS	P		Large fracture in skull, sub-dermal hemorrhage

2/7/04	mortality	Adult female #1004	Virginia Beach, VA	P		Severe subdermal bruising, complete fracture of rostrum and laceration of oral rete.
9/6/04	mortality	Adult female #2301	Roseway Basin, NS		P	Extensive constricting line on head and left flipper. Found dead March 3, 2005 on Ship Shoal Island, VA.
11/24/04	mortality	Adult female #1909	Ocean Sands, NC	P		Left fluke lobe severed and large bore blood vessels exposed.

STATUS OF STOCK

The size of this stock is considered to be extremely low relative to OSP in the U.S. Atlantic EEZ, and this species is listed as endangered under the ESA. The North Atlantic right whale is considered one of the most critically endangered populations of large whales in the world (Clapham *et al.* 1999). A Recovery Plan has been published for the North Atlantic right whale and is in effect (~~NOAANational Marine Fisheries 1991), and a revised plan is under review.Service~~NMFS 2005). Three critical habitats, Cape Cod Bay/Massachusetts Bay, Great South Channel, and the Southeastern U.S.~~,~~ were designated by ~~NOAA Fisheries~~NMFS (59 FR 28793, June 3, 1994). ~~The NOAA~~A National Marine Fisheries Service ESA 1996 review of Northern Right Whale ~~Status Review~~ status concluded that the ~~status of the~~ western North Atlantic population of the northern right whale remains endangered [~~we note~~Note that ~~>~~'northern right ~~whale~~ whale' is nomenclature that is ~~an~~now outdated ~~classification and reference should be made to either~~in the scientific literature but not yet modified in rule makings. Scientific literature recognizes north Atlantic ~~or~~ and north Pacific right whales~~,~~ as two distinct species]; this conclusion was reinforced by the International Whaling Commission (Best *et al.* 2001), which expressed grave concern regarding the status of this stock. The total level of human-caused mortality and serious injury is unknown, but reported human-caused mortality and serious injury has been a minimum of ~~3.~~2.8 right whales per year from ~~1999~~2000 through ~~2003.~~2004. Given that PBR has been set to zero, no mortality or serious injury for this stock can be considered insignificant. This is a strategic stock because the average annual fishery-related mortality and serious injury exceeds PBR, and because the North Atlantic right whale is an endangered species. Relative to populations of southern right whales, there are also concerns about growth rate, percentage of reproductive females, and calving intervals in this population.

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HUMPBACK WHALE (*Megaptera novaeangliae*): Gulf of Maine Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, humpback whales feed during spring, summer and fall over a range which encompasses the eastern coast of the United States (including the Gulf of Maine), the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Katona and Beard 1990). Other North Atlantic feeding grounds occur off Iceland and northern Norway, including off Bear Island and Jan Mayen (Christensen *et al.* 1992; Palsbøll *et al.* 1997). These six regions represent relatively discrete subpopulations, fidelity to which is determined matrilineally (Clapham and Mayo 1987). Genetic analysis of mitochondrial DNA (mtDNA) has indicated that this fidelity has persisted over an evolutionary timescale in at least the Icelandic and Norwegian feeding grounds (Palsbøll *et al.* 1995; Larsen *et al.* 1996). Previously, the North Atlantic humpback whale population was treated as a single stock for management purposes (Waring *et al.* 1999). Indeed, earlier genetic analyses (Palsbøll *et al.* 1995), based upon relatively small sample sizes, had failed to discriminate among the four western North Atlantic feeding areas. However, genetic analyses often reflect a timescale of thousands of years, well beyond those commonly used by managers. Accordingly, the decision was recently made to reclassify the Gulf of Maine as a separate feeding stock; this was based upon the strong fidelity by individual whales to this region, and the attendant assumption that, were this subpopulation wiped out, repopulation by immigration from adjacent areas would not occur on any reasonable management timescale. This reclassification has subsequently been supported by new genetic analysis based upon a much larger collection of samples than those utilized by Palsbøll *et al.* (1995). These analyses have found significant differences in mtDNA haplotype frequencies ~~of the~~ among whales sampled in four western feeding areas, including the Gulf of Maine (Palsbøll *et al.* 2001). During the recent Comprehensive Assessment of North Atlantic humpback whales, the International Whaling Commission acknowledged the evidence for treating the Gulf of Maine as a separate stock for the purpose of management (IWC 2002).

During the summers of 1998 and 1999, the Northeast Fisheries Science Center conducted surveys for humpback whales on the Scotian Shelf. The objective of these surveys was to establish the occurrence and population identity of the animals found in this region, which lies between the well-studied populations of the Gulf of Maine and Newfoundland. Photographs from both surveys have now been compared to both the overall North Atlantic Humpback Whale Catalogue and a large regional catalogue from the Gulf of Maine (maintained by the College of the Atlantic and the Center for Coastal Studies, respectively); this work is summarized in Clapham *et al.* (2003). The match rate between the Scotian Shelf and the Gulf of Maine was 27% (14 of 52 Scotian Shelf individuals from both years). Comparable rates of exchange were obtained from the southern (26%, n=10 of 36 whales) and northern (27%, *n*=4 of 15 whales) ends of the Scotian Shelf, despite the additional distance of nearly 100 nautical miles (one whale was observed in both areas). In contrast, all (36 of 36) humpback whales identified by the same NMFS surveys elsewhere in the Gulf of Maine (including Georges Bank, southwestern Nova Scotia and the Bay of Fundy) had been previously observed in the Gulf of Maine region. The sighting histories of the 14 Scotian Shelf whales matched to the Gulf of Maine suggested that many of them were transient through the latter area. There were no matches between the Scotian Shelf and any North Atlantic feeding ground, except the Gulf of Maine; however, instructive comparisons are compromised by the often low sampling effort in other regions in recent years. Overall, while it is not possible to define the Gulf of Maine population by drawing a strict geographical boundary, it appears that the effective range of many members of this stock does not extend onto the Scotian Shelf. Further work on the Scotian Shelf was conducted in August 2002 and August 2003; this sampling extended further north and east as far as the Laurentian Channel, and the results are expected to further clarify the issue of stock identity from this region. ~~The~~ A very low match rate between ~~the~~ these two ~~sampled~~ years (only one animal was resighted in the region in both 1998 and 1999) ~~suggests~~supports the hypothesis that the Scotian Shelf is host to a larger population of humpback whales than was previously thought. However, preliminary analysis of photographs collected in 2002 and 2003 revealed ~~a number of~~multiple inter-annual matches; it is not yet clear whether a suitably precise abundance estimate can be calculated from these data.

~~In~~During winter, whales from ~~all~~most identified Atlantic feeding areas (including the Gulf of Maine) mate and calve primarily in the West Indies, where spatial and genetic mixing among subpopulations occurs (Clapham *et al.* 1993; Katona and Beard 1990; Palsbøll *et al.* 1997; Stevick *et al.* 1998). A few whales of unknown northern origin migrate to the Cape Verde Islands (Reiner *et al.*~~,~~ 1996). In the West Indies, the majority of whales are found in the waters of the Dominican Republic, notably on Silver Bank, ~~on~~ Navidad Bank, and in Samana Bay (Balcomb and Nichols 1982; Whitehead and Moore 1982; Mattila *et al.* 1989, 1994). Humpback whales are also found at much lower densities throughout the remainder of the Antillean arc, from Puerto Rico to the coast of Venezuela (Winn *et al.* 1975; Levenson and Leapley 1978; Price 1985; Mattila and Clapham 1989).

It is apparent that not all whales migrate to the West Indies every winter, and that significant numbers of animals are found in mid- and high-latitude regions at this time (Clapham *et al.* 1993; Swingle *et al.* 1993). An increased number of sightings of humpback whales in the vicinity of the Chesapeake and Delaware Bays occurred in 1992 (Swingle *et al.* 1993). Wiley *et al.* (1995) reported 38 humpback whale strandings which occurred during 1985-1992 in the U.S. mid-Atlantic and southeastern states. Humpback whale strandings increased, particularly along the Virginia and North Carolina coasts, and most stranded animals were sexually immature; in addition, the small size of many of these whales strongly suggested that they had only recently separated from their mothers. Wiley *et al.* (1995) concluded that these areas are becoming an increasingly important habitat for juvenile humpback whales and that anthropogenic factors may negatively impact whales in this area. There have also been a number of wintertime humpback sightings in coastal waters of the southeastern U.S. (NMFS unpublished data; New England Aquarium unpublished data; Florida DEP unpublished data). Whether the increased sightings represent a distributional change, or are simply due to an increase in sighting effort and/or whale abundance, is presently unknown.

A key question with regard to humpback whales off the southeastern and mid-Atlantic states is their population identity. This topic was recently investigated using fluke photographs of living and dead whales observed in the region (Barco *et al.* 2002). In this study, photographs of 40 whales (live or dead) were of sufficient quality to be compared to catalogues from the Gulf of Maine (the closest feeding ground) and other areas in the North Atlantic. Of 21 live whales, 9 (42.9%) matched to the Gulf of Maine, 4 (19.0%) to Newfoundland and 1 (4.8%) to the Gulf of St Lawrence. Of 19 dead humpbacks, 6 (31.6%) were known Gulf of Maine whales. Although the population composition of the mid-Atlantic is apparently dominated by Gulf of Maine whales, lack of recent photographic effort in Newfoundland makes it likely that the observed match rates under-represent the true presence of Canadian whales in the region. Barco *et al.* (2002) suggested that the mid-Atlantic region primarily represents a supplemental winter feeding ground that is used by humpbacks for more than one purpose.

Feeding is the principal activity of humpback whales in New England waters, and their distribution in this region has been largely correlated to prey species and abundance, although behavior and bottom topography are factors in foraging strategy (Payne *et al.* 1986, 1990). Humpback whales are frequently piscivorus when in these waters, feeding on herring (*Clupea harengus*), sand lance (*Ammodytes* spp.), and other small fishes. In the northern Gulf of Maine, euphausiids are also frequently taken (Paquet *et al.* 1997). Commercial depletion of herring and mackerel led to an increase in sand lance in the southwestern Gulf of Maine in the mid 1970's with a concurrent decrease in humpback whale abundance in the northern Gulf of Maine. Humpback whales were densest over the sandy shoals in the southwestern Gulf of Maine favored by the sand lance during much of the late 1970's and early 1980's, and humpback distribution appeared to have shifted to this area (Payne *et al.* 1986). An apparent reversal began in the mid 1980's, and herring and mackerel increased as sand lance again decreased (Fogarty *et al.* 1991). Humpback whale abundance in the northern Gulf of Maine increased dramatically during 1992-1993, along with a major influx of herring (P. Stevick, pers. comm.). Humpback whales were few in nearshore Massachusetts waters in the 1992-1993 summer seasons. They were more abundant in the offshore waters of Cultivator Shoal and the Northeast Peak on Georges Bank, and on Jeffreys Ledge; these latter areas are more traditional locations of herring occurrence. In 1996 and 1997, sand lance~~,~~ and ~~thus~~therefore humpback whales~~,~~ were once again abundant in the Stellwagen Bank area. However, unlike previous cycles, ~~where~~when an increase in sand lance corresponded to a decrease in herring, herring remained relatively abundant in the northern Gulf of Maine, and humpbacks correspondingly continued to occupy this portion of the habitat, where they also fed on euphausiids (unpublished data, Center for Coastal Studies and College of the Atlantic).

In early 1992, a major research initiative known as the Years of the North Atlantic Humpback (YONAH) (Smith *et al.* 1999) was initiated. This project was a large-scale, intensive study of humpback whales throughout almost their entire North Atlantic range, from the West Indies to the Arctic. During two primary years of field work, photographs for individual identification and biopsy samples for genetic analysis were collected from summer feeding areas and from the breeding grounds in the West Indies. Additional samples were collected from certain areas in other years. Results pertaining to the estimation of abundance and to genetic population structure are summarized below.

POPULATION SIZE

The overall North Atlantic population (including the Gulf of Maine) was estimated from genetic tagging data collected by the YONAH project in the breeding range at 4,894 males (95% CI=3,374-7,123) and 2,804 females (95% CI=1,776-4,463) (Palsbøll *et al.* 1997). Since the sex ratio in this population is known to be even (Palsbøll *et al.* 1997), the excess of males is presumed to be a result of sampling bias, lower rates of migration among females or sex-specific habitat partitioning in the West Indies; whatever the reason, the combined total is an underestimate of overall population size in this ocean. Photographic mark-recapture analyses from the YONAH project gave an ocean-basin-wide estimate of 11,570 for 1992/1993 (CV=0.068, Stevick *et al.* 2003), and an additional genotype-based analysis yielded a similar but less precise estimate of 10,400 (95% CI=8,000 to 13,600) (Smith *et al.* 1999). The estimate of 11,570 (CV=0.068) is regarded as the best available estimate for the North Atlantic, although because YONAH sampling was not spatially representative in the feeding grounds, this figure is negatively biased. In the northeastern North Atlantic, Øien (2001) estimated from sighting survey data that there were 889 (CV=0.32) humpback whales in the Barents and Norwegian Seas region.

Estimating abundance for the Gulf of Maine stock has proved problematic. Three approaches have been investigated: mark-recapture estimates, minimum population size, and line-transect estimates. Most of the mark-recapture estimates were affected by heterogeneity of sampling, which was heavily focused on the southwestern Gulf of Maine. However, an estimate of 652 (CV=0.29) derived from the more extensive and representative YONAH sampling in 1992 and 1993 was probably less subject to this bias.

The second approach uses photo-identification data to establish the minimum number of humpback whales known to be alive in a particular year, 1997. By determining the number of identified individuals seen either in that year, or in both a previous and subsequent year, it is possible to determine that at least 497 humpbacks were alive in 1997. This figure is also likely to be negatively biased, again because of heterogeneity of sampling. A similar calculation for 1992 (which would correspond to the YONAH estimate for the Gulf of Maine) yields a figure of 501 whales.

In the third approach, data were used from a 28 July to 31 August 1999 line-transect sighting survey conducted by a ship and airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence. Total track line length was 8,212km. However, in light of the information on stock identity of Scotian Shelf humpback whales noted above, only the portions of the survey covering the Gulf of Maine were used; surveys blocks along the eastern coast of Nova Scotia were excluded. Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)* (Palka 2000). These surveys yielded an estimate of 816 humpbacks (CV=0.45). However, given that the rate of exchange between the Gulf of Maine and both the Scotian Shelf and mid-Atlantic region is not zero, this estimate is likely to be somewhat conservative. Accordingly, inclusion of data from 25% of the Scotian Shelf survey area (to reflect the match rate of 25% between the Scotian Shelf and the Gulf of Maine) gives an estimate of 902 whales (CV=0.41). Since the mark-recapture figures for abundance and minimum population size given above falls above the lower bound of the CV of the line transect estimate, and given the known exchange between the Gulf of Maine and the Scotian Shelf, we have chosen to use the latter as the best estimate of abundance for Gulf of Maine humpback whales.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for Gulf of Maine humpback whales is 902 (CV=0.41). The minimum population estimate for this stock is 647.

Table 1. Summary of abundance estimates for Gulf of Maine humpback whales. CCS = Center for Coastal Studies. COA = College of the Atlantic.

Month/Year	Type	N	CV	Source
1992/93	Mark-recapture estimate	652	0.29	Clapham *et al.* (2003)
1997	Minimum known to be alive	497	-	CCS + COA data
July/August 1999	Line transect, including a portion of the Scotian Shelf stratum	902	0.41	Palka 2000, Clapham *et al.* 2003

Current Population Trend

As detailed below, current data suggest that the Gulf of Maine humpback whale stock is steadily increasing in size. This is consistent with an estimated average trend of 3.1% (SE=0.005) in the North Atlantic population overall for the period 1979-1993 (Stevick *et al.* 2003), although there are no other feeding-area-specific estimates.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Barlow and Clapham (1997) applied an interbirth interval model to photographic mark-recapture data and estimated the population growth rate of the Gulf of Maine humpback whale stock at 6.5% (CV=0.012). Maximum net productivity is unknown for this population, although a theoretical maximum for any humpback population can be calculated using known values for biological parameters (Brandão *et al.* 2000; Clapham *et al.* 2001). For the Gulf of Maine, data supplied by Barlow and Clapham (1997) and Clapham *et al.* (1995) gives values of 0.96 for survival rate, 6 years as mean age at first parturition, 0.5 as the proportion of females, and 0.42 for annual pregnancy rate. From this, a maximum population growth rate of 0.072 is obtained according to the method described by Brandão *et al.* (2000). This suggests that the observed rate of 6.5% (Barlow and Clapham 1997) was close to the maximum for this stock.

Clapham *et al.* (2003) updated the Barlow and Clapham (1997) analysis using data from the period 1992 to 2000. The estimate was either 0% (for a calf survival rate of 0.51) or 4.0% (for a calf survival rate of 0.875). Although confidence limits are not available (because maturation parameters could not be estimated), both estimates of population growth rate are outside the 95% confidence intervals of the previous estimate of 6.5% for the period 1979 to 1991 (Barlow and Clapham 1997). It is unclear whether this apparent decline is an artifact resulting from a shift in distribution; indeed, such a shift occurred during exactly the period (1992-1995) in which survival rates declined. It is possible that this shift resulted in calves born in those years imprinting on (and thus subsequently returning to) areas other than those in which intensive sampling occurs. If the decline is a real phenomenon it may be related to known high mortality among young-of-the-year whales in the waters of the U.S. mid-Atlantic states. However, calf survival appears to have increased since 1996, presumably accompanied by an increase in population growth.

In light of the uncertainty accompanying the more recent estimate of population growth rate for the Gulf of Maine, for purposes of this assessment the maximum net productivity rate was assumed to be the default value for cetaceans of 0.04 (Barlow *et al.* 1995).

Current and maximum net productivity rates are unknown for the North Atlantic population overall. As noted above, Stevick *et al.* (2003) calculated an average population growth rate of 3.1% (SE=0.005) for the period 1979-1993.

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 647. The maximum productivity rate is the default value of 0.04. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.10 because this stock is listed as an endangered species under the Endangered Species Act (ESA). PBR for the Gulf of Maine humpback whale stock is 1.3 whales.

ANNUAL HUMAN-CAUSED SERIOUS INJURY AND MORTALITY

For the period ~~1999~~2000 through ~~2003~~2004, the total estimated human-caused mortality and serious injury to the Gulf of Maine humpback whale stock is estimated as 3.~~6~~0 per year (U.S. waters, 2.~~6~~4; Canadian waters, 0.6~~; St. Vincent and the Grenadines, 0.4~~). This average is derived from ~~three components: 1)~~ incidental fishery interaction records, 2.~~6~~4 (U.S. waters, ~~2.0~~1.8; Canadian waters, 0.6); ~~2)~~ and records of vessel collisions, 0.6 (U.S. waters, 0.6; Canadian waters, 0~~), and directed takes from the Bequian harvest in St. Vincent and the Grenadines (0.4~~). There were additional humpback mortalities and serious injuries that occurred in the southeastern and mid-Atlantic states that could not be confirmed as involving members of the Gulf of Maine stock. These records represent an additional minimum annual average of ~~1.8~~2.0 human-caused mortalities and serious injuries to humpbacks over the time period, of which 1.2 per year are attributable to incidental fishery interactions and 0.~~6~~8 per year are attributable to vessel collisions.

Beginning with the 2001 Stock Assessment Report, Canadian records were incorporated into the mortality and serious injury rates, to reflect the effective range of this stock as described above. In addition, records from the southeastern and mid-Atlantic states involving individuals that could not be identified as members of the Gulf of Maine stock were tallied separately. Conversely, records involving unidentified individuals reported between New York and the Bay of Fundy were assumed to be whales from the Gulf of Maine stock. It is also important to stress that serious injury determinations are made based upon the best available information at the time of writing; these determinations may change with the availability of new information. For the purposes of this report, discussion is primarily limited to those records considered confirmed human-caused mortalities or serious injuries.

To better assess human impacts (both vessel collision and ~~-~~gear entanglement), and considering the number of decomposed and incompletely or unexamined animals in the records, there needs to be greater emphasis on the timely recovery of carcasses and complete necropsies. The literature and ~~-~~review of records described here suggest that there are significant human impacts beyond those recorded in the fishery observer data. For example, a study of entanglement-related scarring on the caudal peduncle of 134 individual humpback whales in the Gulf of Maine suggested that between 48% and 65% had experienced entanglements (Robbins and Mattila 2001). Decomposed and/or unexamined animals (e.g., carcasses reported but not retrieved or ~~necropsied~~no necropsy performed) represent 'lost data' some of which may relate to human impacts.

Serious injury was defined in 50 CFR part 229.2 ~~as~~ to be an injury that was likely to lead to mortality. We therefore limited the serious injury designation to only those reports that had substantiated evidence that the injury, whether from entanglement or vessel collision, was likely to lead to the whale's death. Determinations of serious injury were made on a case~~-~~-by~~-~~-case basis following recommendations from the workshop conducted in 1997 on differentiating serious and non-serious injuries (Angliss and DeMaster 1998). Injuries that impeded the whale's locomotion or feeding were not considered serious injuries unless they were likely to be fatal in the foreseeable future. There was no forecasting of how the entanglement or injury may increase the whale's susceptibility to further injury, namely from additional entanglements or vessel collisions. For these reasons, the human impacts listed in this report are a minimum estimate.

Background

As with right whales, human impacts (vessel collisions and entanglements) are factors which may be slowing recovery of the humpback whale population. There is an average of 4 to 6 entanglements of humpback whales a year in waters of the southern Gulf of Maine and additional reports of vessel-collision scars (unpublished data, Center for Coastal Studies). Of 20 dead humpback whales (principally in the mid-Atlantic, where decomposition did not preclude examination for human impacts), Wiley *et al.* (1995) reported that 6 (30%) had major injuries possibly attributable to ship strikes, and 5 (25%) had injuries consistent with possible entanglement in fishing gear. One whale displayed scars that may have been caused by both ship strike and entanglement. Thus, 60% of the whale carcasses which were suitable for examination showed signs that anthropogenic factors may have contributed to, or been responsible for, their death. Wiley *et al.* (1995) further reported that all stranded animals were sexually immature, suggesting a winter or migratory segregation and/or that juvenile animals are more susceptible to human impacts.

An updated analysis of humpback whale mortalities from the mid-Atlantic states region has recently been produced by Barco *et al.* (2002). Between 1990 and 2000, there were 52 known humpback whale mortalities in the waters of the U.S. mid-Atlantic states. ~~Length~~Inspection of length data from 48 of these whales (18 females, 22 males, and 8 of unknown sex) suggested that 39 (81.2%) were first-year animals, 7 (14.6%) were immature and 2 (4.2%) were adults. However, sighting histories of 5 of the dead whales indicate that some were small for their age, and histories of live whales further indicate that the population contains a greater percentage of mature animals than ~~is~~was suggested by the stranded sample.

In their study of entanglement rates estimated from caudal peduncle scars, Robbins and Mattila (2001) found that males were more likely to be entangled than females. The scarring data also suggested that yearlings were more likely than other age classes to be involved in entanglements. Finally, female humpbacks showing evidence of prior entanglements produced significantly fewer calves, suggesting that entanglement may significantly impact reproductive success.

Humpback whale entanglements also occur in relatively high numbers in Canadian waters. Reports of collisions with fixed fishing gear set for groundfish around Newfoundland averaged 365 annually from 1979 to 1987 (range 174-813). An average of 50 humpback whale entanglements (range 26-66) was reported annually between 1979 and 1988, and 12 of 66 humpback whales that were entangled in 1988 died (Lien *et al.* 1988). Volgenau *et al.* (1995) also summarized existing data and concluded that in Newfoundland and Labrador, cod traps caused the most entanglements and entanglement mortalities (21%) of humpbacks between 1979 and 1992. They also reported that gillnets are the gear that has been the primary cause of entanglements and entanglement mortalities (20%) of humpbacks in the Gulf of Maine between 1975 and 1990.

Disturbance by whale watching may prove to be an important habitat issue in some areas of this population's range, notably the coastal waters of New England where the density of whale watching traffic is seasonally high. No studies have been conducted to address this question, and its impact (if any) on habitat occupancy and reproductive success is unknown.

Fishery-Related Serious Injuries and Mortalities

A description of Fisheries is provided in Appendix III. Two mortalities were observed in the pelagic drift gillnet fishery since 1989. In winter 1993, a juvenile humpback was observed entangled and dead in a pelagic drift gillnet along the 200m isobath northeast of Cape Hatteras; in early summer 1995, a humpback was entangled and dead in a pelagic drift gillnet on southwestern Georges Bank. Additional reports of mortality and serious injury relevant to comparison to PBR, as well as description of total human impacts, are contained in records maintained by NMFS. A number of these records (11 entanglements involving lobster pot/trap gear) from the 1990-1994 period were cause to reclassify the lobster fishery (62 FR 33, Jan. 2, 1997).

For this report, the records of dead, injured, and/or entangled humpbacks (found either stranded or at sea) for the period ~~1999~~2000 through ~~2003~~2004 were reviewed. Out of ~~173~~175 records, ~~148~~159 were eliminated from further consideration due to an absence of any evidence of human impact or, in the case of an entangled whale, it was documented that the animal had become disentangled (10 were disentangled in 2003 alone). Of the remaining records, the Gulf of Maine stock sustained 4 mortalities attributable to fishery interactions and ~~9~~8 cases of serious injuries ~~-13~~ 12 records in the five-year period (Table 2). In addition, 3 mortalities and 3 serious injuries were documented in the southeastern and mid-Atlantic states that involved interactions with fisheries. At the time of this writing, no genetic results were available to identify which of these cases may have involved whales from the Gulf of Maine stock. While these records are not statistically quantifiable in the same way as the observed fishery records, they provide some indication of the frequency of entanglements.

Table 2. ~~Summarized records of~~ Confirmed human-caused mortality and serious injury ~~likely to result in mortality, for~~ records of North Atlantic humpback whales, January ~~1999~~2000 - December ~~2003. Causes of mortality or injury, assigned as primary or secondary, are based on records maintained by NMFS.~~2004. Records ~~counted as~~ from the Gulf of Maine humpback whale stock are indicated by an asterisk (*) following the date. Stock identification of the remaining records ~~are awaiting~~awaits genetic analysis results. These may identify additional Gulf of Maine whales.

Date	Report Type	Sex, age, ID length	Location	Assigned Cause: P=primary, S=secondary		Notes/Observations
				Ship strike	Entang./ Fsh.inter	
~~1/12/99*~~	~~mortality~~	~~9.7m male~~	~~Martha's Vineyard, MA~~		~~P~~	~~Fresh and extensive rope marks on carcass with associated hemorrhaging~~
~~3/6/99*~~	~~mortality~~	~~13.8m female and calf~~	~~Bequia, St. Vincent and the Grenadines~~			~~Two whales taken by the Bequian harpoon fishery~~
~~8/2/99*~~	~~serious injury~~	~~9.4m estimated~~	~~Bay of Fundy, Canada~~		~~P~~	~~Single wrap of ½ inch poly line pinning flippers~~
~~9/23/99*~~	~~serious injury~~	~~unknown~~	~~off Chatham, MA~~		~~P~~	~~Line out of mouth and several wraps around body; possibly anchored~~
1/8/00	serious injury	9.9m estimated	30mi east Cape Lookout, NC		P	whale swam off with 600' of sea trout sink gillnet, a chain anchor and a high flyer in tow
8/4/00*	serious injury	10.7m estimated	Bay of Fundy, Canada		P	~~gillnet~~ line wrapped on head with weighted trailing line giving tension, no gear recovered
9/6/00*	serious injury	<1 yr old, calf of "Giraffe"	Stellwagen Bank, MA		P	single line wrapped across back; constriction will increase as whale grows, no gear recovered

10/14/00	serious injury	9.9m estimated	off Ocean City Inlet, MD		P	heavily entangled in line ~~and netting~~; constrictive--fresh wounds noted; no gear recovered
10/20/00*	serious injury	10 yr old male “Tribble”	Stellwagen Bank, MA		P	entangled in green poly line on multiple body parts; appears constrictive, no gear recovered
1/25/01	mortality	6.9m estimated	Avon, NC	P		extensive hemorrhaging along left thoracic, clean cut through center of vertebrae; ship strike
4/8/01	mortality	7.9m juvenile male	Myrtle Beach, SC	S	P	pre-mortem evidence of chronic line entanglement; severe prop wounds, no gear recovered
4/~~8~~7/01	mortality	7.6m juvenile male	Emerald Isle, NC		P	entanglement around peduncle caused extensive edema, hemorrhaging, no gear recovered
4/9/01*	mortality	8.8m juvenile female “Inland”	offshore of Sandbridge, Virginia Beach		P	found anchored in ~~gillnet~~ sink gillnet croaker fishery gear; line wraps around rostrum had immobilized the whale
7/29/01*	mortality	8.5m juvenile female	floating south of Verrazano Bridge, NY	P		large laceration on left side of head, extensive fracturing of skull
10/1/01*	mortality	11.4m 3 yr old female “Pitfall”	Duxbury Beach, MA	P		massive fracturing to skull, focal bruising indicative of pre-mortem ship strike
2/8/02	mortality	8.4m juvenile female	off Cape Henry, VA	P		three large lacerations, hemorrhaging, broken bones
3/24/02	mortality	8.0m juvenile male	off Virginia Beach, VA		P	deep cuts on caudal peduncle and tail indicative of embedded line, no gear recovered
6/3/02*	mortality	9.9m	off Cape Elizabeth, ME		P	deep cuts on caudal peduncle indicative of embedded line, state water lobster fishery
6/17/02*	serious injury	10.2m estimated	Cape Cod Bay, MA		P	fluke severely damaged by line, whale emaciated
8/1/02*	mortality	9.3m male	Long Island, NY	P		large hematoma posterior to blow holes
10/1/02*	mortality	7.5m female calf	Plymouth, MA		P	found wrapped in ~~lobster warp~~line, extensive bruising, no gear recovered

6/6/03	mortality	8.3m female	Chesapeake Bay mouth, VA	P		major trauma to right side of head, hematoma
7/9/03*	serious injury	calf of Shockwave	Bay of Fundy, Canada		P	constricting entanglement on a young whale, no gear recovered
7/12/03	serious injury	unknown	Oregon Inlet, NC		P	entangled in substantial amount of gear, no gear recovered
8/15/03*	mortality	7.3m (est)calf	Petit Manan Island, ME		P	floating offshore wrapped in line
8/16/03*	serious injury	unknown	off Cape Cod, MA		P	poor body condition; line deeply embedded
8/18/03*	serious injury	unknown	off Cape Cod, MA		P	extensive entanglement, no gear recovered
7/11/04*	serious injury	"Lucky" subadult	Briar Island, NS		P	constricting entanglement on a young whale
10/3/04*	mortality	15m (est) unknown	Georges Bank		P	fresh carcass with entangling line and high flyer
12/19/04	mortality	8.0m calf	Bethany Beach, DE	P		hematoma and skeletal fracturing

a. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.

b. National guidelines for determining what constitutes a serious injury have not been finalized. Interim criteria as established by NERO/NMFS (~~62 FR 33, Jan. 2, 1997~~Cole *et al.* 2005) have been used here. Some assignments may change as new information becomes available and/or when national standards are established.

~~c. Assigned cause based on best judgement of available data. Additional information may result in revisions.~~

~~d. Entanglements of juvenile whales may become more serious as the whale grows.~~

Other Mortality

Between November 1987 and January 1988, at least 14 humpback whales died after consuming Atlantic mackerel containing a dinoflagellate saxitoxin (Geraci *et al.* 1989). The whales subsequently stranded or were recovered in the vicinity of Cape Cod Bay and Nantucket Sound, and it is highly likely that other mortalities occurred during this event which went unrecorded. In July 2003, another Unusual Mortality Event was recorded in offshore waters when an estimated minimum of 12-15 humpback whales died in the vicinity of the Northeast Peak of Georges Bank. Preliminary tests of samples taken from some of these whales tested positive for domoic acid at low levels, but it is currently unknown what levels would affect the whales and therefore no definitive conclusions can yet be drawn regarding the cause of this event. Its effect on the status of the Gulf of Maine humpback whale population is currently unknown.

During the first six months of 1990, seven dead juvenile (7.6 to 9.1 m long) humpback whales stranded between North Carolina and New Jersey. The significance of these strandings is unknown, but is a cause for some concern.

As reported by Wiley *et al.* (1995), injuries possibly attributable to ship strikes are more common and probably more serious than those from entanglements. In the NMFS records for ~~1999~~2000 through ~~2003, 15~~2004, 10 records had some evidence of a collision with a vessel. Of these, ~~6~~7 were mortalities as a result of the collision, and ~~8~~2 did not have sufficient information to confirm the collision as the cause of death. The remaining incident occurred on 10/4/01 and involved a whale-watch vessel. Photos taken at the time of the collision confirmed that the injury was minor and follow-up documentation provided evidence that the injury sustained had healed. Three ~~out~~ of ~~the 6~~7 cases of mortality from a vessel collision involved whales identified as members of the Gulf of Maine stock (7/29/01, 10/1/01 and 8/1/02; see Table 2).

~~On 6 March 1999, a 46-foot female and what was likely her calf (20-23 feet in length) were taken by the Bequian harvest in St. Vincent and the Grenadines. The larger whale was identified as a Gulf of Maine whale (J. Robbins, pers. comm.).~~

STATUS OF STOCK

The status of the North Atlantic humpback whale population was the topic of an International Whaling Commission Comprehensive Assessment in June 2001, and again in May 2002; these meetings conducted a detailed review of all aspects of this population (IWC 2002). Although the most recent estimates of abundance indicate continued population growth, the size of the humpback whale stock may be below OSP in the U.S. Atlantic EEZ. This is a strategic stock because the humpback whale is listed as an endangered species under the ESA. A Recovery Plan has been published and is in effect (NMFS 1991). There are insufficient data to reliably determine current population trends for humpback whales in the North Atlantic overall. The average annual rate of population increase was estimated at 3.1% (SE=0.005, Stevick *et al.* 2003). As noted above, a recent analysis of demographic parameters for the Gulf of Maine (Clapham *et al.* 2003) suggested a lower rate of increase than the 6.5% reported by Barlow and Clapham (1997), but results may have been confounded by distribution shifts. The total level of human-caused mortality and serious injury is unknown, but current data indicate that it is significant. In particular, the continued high level of mortality among humpback whales off the U.S. mid-Atlantic states (Barco *et al.* 2002)~~,~~ is cause for considerable concern given that at least some of these animals are known to be from the Gulf of Maine. This is a strategic stock because the average annual fishery-related mortality and serious injury exceeds PBR, and because the North Atlantic humpback whale is an endangered species.

A new large-scale assessment called More of North Atlantic Humpbacks (MoNAH) project is currently underway. This two-year study will attempt to estimate abundance and refine knowledge of population structure with extensive sampling in the Gulf of Maine/Scotian Shelf region and on the primary wintering ground on Silver Bank; additional research will focus on the U.S. mid-Atlantic states. The work is intended to update the YONAH assessment of North Atlantic humpback whales in preparation for a possible status review under the Endangered Species Act.

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FIN WHALE (*Balaenoptera physalus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The Scientific Committee of the International Whaling Commission (IWC) has proposed stock boundaries for North Atlantic fin whales. Fin whales off the eastern U~~.S. north to~~nited States, Nova Scotia and the southeastern coast of Newfoundland are believed to constitute a single stock under the present IWC scheme (Donovan 1991). However, the stock identity of North Atlantic fin whales has received relatively little attention, and whether the current stock boundaries define biologically isolated units has long been uncertain. The existence of a subpopulation structure was suggested by local depletions that resulted from commercial overharvesting (Mizroch *et al.* 1984).

A genetic study conducted by Bérubé *et al.* (1998) using both mitochondrial and nuclear DNA provided strong support for an earlier population model proposed by Kellogg (1929) and others. This postulates the existence of several subpopulations of fin whales in the North Atlantic and Mediterranean, with limited gene flow among them. Bérubé *et al.* (1998) also proposed that the North Atlantic population showed recent divergence due to climatic changes (i.e~~.~~., postglacial expansion), as well as substructuring over even relatively short distances. The genetic data are consistent with the idea that different subpopulations use the same feeding ground, a hypothesis that was also originally proposed by Kellogg (1929).

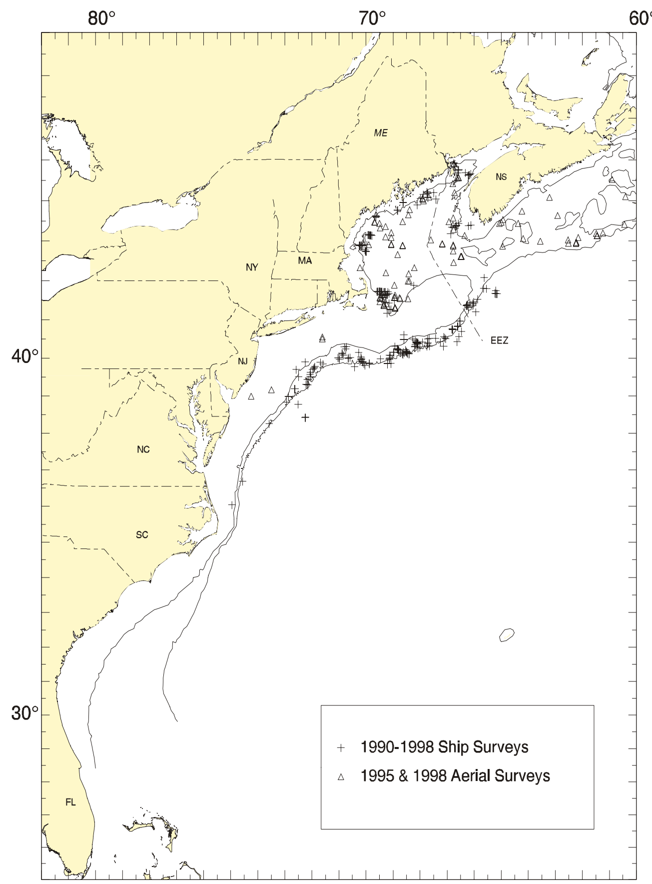

Figure 1. *Distribution of fin whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1990-1998. Isobaths are at 100 m and 1,000 m.*

Fin whales are common in waters of the U. S~~.~~. Atlantic Exclusive Economic Zone (EEZ), principally from Cape Hatteras northward (~~figure~~Figure 1). Fin whales accounted for 46% of the large whales and 24% of all cetaceans sighted over the continental shelf during aerial surveys (CETAP 1982) between Cape Hatteras and Nova Scotia during 1978-82. While ~~a great deal~~much remains unknown, the magnitude of the ecological role of the fin whale is impressive. In this region fin whales are probably the dominant large cetacean species in all seasons, with the largest standing stock, the largest food requirements, and therefore the largest impact on the ecosystem of any cetacean species (Kenney *et al.* 1997; Hain *et al.* 1992).

There is little doubt that New England waters represent a major feeding ground for the fin whale. There is evidence of site fidelity by females, and perhaps some segregation by sexual, maturational or reproductive class on the feeding range (Agler *et al.* 1993). Seipt *et al.* (1990) reported that 49% of identified fin whales on Massachusetts Bay area feeding grounds were resighted within the same year, and 45% were resighted in multiple years. While recognizing localized as well as more extensive movements, these authors suggested that fin whales on these grounds exhibited patterns of seasonal occurrence and annual return that are in some respects similar to those shown for humpback whales. This was reinforced by Clapham and Seipt (1991), who showed maternally directed site fidelity by fin whales in the Gulf of Maine. Information on life history and vital rates is also available in data from the Canadian fishery, 1965-1971 (Mitchell 1974). In seven years, 3,528 fin whales were taken at three whaling stations. The station at Blandford, Nova Scotia, took 1,402 fin whales.

Hain *et al.* (1992), based on an analysis of neonate stranding data, suggested that calving takes place during approximately four months from October to January in latitudes of the U.S. mid-Atlantic region; however, it is unknown where calving, mating, and wintering for most of the population occurs. Results from the Navy's SOSUS program (Clark 1995) indicate a substantial deep-ocean component to fin whale distribution. It is likely that fin whales occurring in the U. S. Atlantic EEZ undergo migrations into Canadian waters, open-ocean areas, and perhaps even subtropical or tropical regions. However, the popular notion that entire fin whale populations make distinct annual migrations like some other mysticetes has questionable support in the data; in the North Pacific, year-round monitoring of fin whale calls found no evidence for large-scale migratory movements (Watkins *et al.* 2000).

POPULATION SIZE

Two estimates of abundance from line-transect surveys are available. An abundance of 2,200 (CV=0.24) fin whales was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane~~ that~~. The survey covered waters from Virginia to the mouth of the Gulf of St. Lawrence~~. Data collection and analysis methods used were described in ~~ (Palka ~~(~~1995).

A more recent estimate of 2,814 (CV=0.21) fin whales was derived from a 28 July to 31 August 1999 line-transect sighting survey conducted by a ship and airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence. Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)* (Palka 2000).

The latter abundance estimate is considered the best available for the western North Atlantic fin whale because it is relatively recent. However, this estimate must be considered extremely conservative in view of the known range of the fin whale in the entire western North Atlantic, the uncertainties regarding population structure and exchange between surveyed and unsurveyed areas, and aerial data having not been corrected for *g(0)*.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for fin whales is 2,814 (CV=0.21). The minimum population estimate for the western North Atlantic fin whale is 2,362.

Current Population Trend

There are insufficient data to determine population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Based on photographically identified fin whales, Agler *et al.* (1993) estimated that the gross annual reproduction rate was at 8%, with a mean calving interval of 2.7 years.

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 2,362. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.10 because the fin whale is listed as endangered under the Endangered Species Act (ESA). PBR for the western North Atlantic fin whale is 4.7.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The number of fin whales taken at 3 whaling stations in Canada from 1965 to 1971 totaled 3,528 whales (Mitchell 1974). Reports of non-directed takes of fin whales are fewer over the last two decades than for other endangered large whales such as right and humpback whales. There was no reported fishery-related mortality or serious injury to fin whales in fisheries observed by NMFS during ~~1999~~2000 through ~~2003~~2004. A review of NMFS records from ~~1999~~2000 through ~~2003~~2004 yielded an average of 1.~~4~~8 human-caused mortalities and serious injuries per year ~~-~~ 0.~~4~~8 per year resulting from fishery interactions/entanglements (U.S. waters, 0.4; Canadian waters, 0.2; ~~-~~Bermudian waters, 0.2), and 1.0 due to vessel collisions~~—~~--all in U.S. waters (Table 1).

Fishery-Related Serious Injury and Mortality

No confirmed fishery-related mortality or serious injury of fin whales was reported in the NMFS Sea Sampling bycatch database. A review of the records of stranded, floating or injured fin whales for the period ~~1999~~2000 through ~~2003~~2004 on file at NMFS found ~~two~~three records with substantial evidence of fishery interactions causing mortality, and one record resulting in serious injury (Table 1), which results in an annual rate of serious injury and mortality of 0.~~4~~8 fin whales from fishery interactions. While these records are not statistically quantifiable in the same way as the observed fishery records, they give a minimum estimate of the frequency of entanglements for this species. In addition to the records above, there are were 5 additional records of entanglement within the period that either lacked substantial evidence for a serious injury determination, or that did not provide the detail necessary to determine if an entanglement had been a contributing factor in the mortality.

Table 1. ~~Summarized records of~~ Confirmed human-caused mortality and serious injury ~~likely to result in mortality, Western~~ records of North Atlantic fin ~~whale stock~~whales, January ~~1999~~2000 - December ~~2003. Causes of mortality or injury, assigned as primary or secondary, are based on records maintained by NMFS.~~2004.

Date	Report Type	Sex, age, ID length	Location	Assigned Cause: P=primary, S=secondary		Notes
				Ship strike	Entang./ Fsh.inter	
~~2/10/99~~	~~mortality~~	~~15.5m male~~	~~Virginia Beach, VA~~	~~P~~		~~large external wound, extensive fractures to vertebral column, hemorrhaging~~
~~11/5/99~~	~~mortality~~	~~16.2m male~~	~~Elizabeth, NJ~~	~~P~~		~~large wound anterior of the blowhole, severed left flipper, shattered bones~~
12/11/00	mortality	10.9m female	New York harbor	P		hemorrhage and fractured bones on right side
1/2/01	mortality	18.1m female	New York harbor	P		dorsal abrasion marks, hematoma
2/1/01	mortality	14.5m female	Port Elizabeth, NJ	P		very fresh carcass hung on ship's bow
9/19/01	mortality	10.7m unknown	off Bermuda		P	extensive fresh entanglement marks
7/28/02	mortality	~~–~~unknown	Georges Bank		P	heavy line seen on tail stock, appeared embedded
2/12/04	serious injury	unknown	Pea Island, NC		P	Entangled whale noticeably emaciated; no gear recovered
2/25/04	mortality	16.3m female	Port Elizabeth, NJ	P		Displaced vertebrae, ruptured aorta

6/30/04	mortality	12m est. unknown	Georges Bank		P	Fresh dead; heavy line constricting mid-section; no gear recovered
9/26/04	mortality	15m est. unknown	St. Johns, NB	P		Fresh carcass on bow of ship

a. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.
b. National guidelines for determining what constitutes a serious injury have not been finalized. Interim criteria as established by NERO/NMFS (62 FR 33, Jan. 2, 1997) have been used here. Some assignments may change as new information becomes available and/or when national standards are established.
c. Assigned cause based on best judgement of available data. Additional information may result in revisions.

Other Mortality

After reviewing NMFS records for ~~1999~~2000 through ~~2003~~2004, 5 were found that had sufficient information to confirm the cause of death as collisions with vessels (Table 1). ~~One record (8/4/97) had been omitted from previous reports, but is inserted here following an examination of the exhumed skeletal remains which found a broken jaw and cracked scapula which had partially healed. The partial healing indicates the whale was alive at the time of the incident.~~

These records constitute an annual rate of serious injury or mortality of 1.0 fin whales from collisions with vessels. NMFS data holdings include ~~four~~six additional records of fin whale collisions with vessels, but the available supporting documentation was insufficient to determine if the whales sustained mortal injuries from the encounters.

STATUS OF STOCK

The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown, but the species is listed as endangered under the ESA. There are insufficient data to determine the population trend for fin whales. The total level of human-caused mortality and serious injury is unknown. The records on hand at NMFS represent coverage of only a portion of the area surveyed for the population estimate for the stock. The total fishery-related mortality and serious injury for this stock derived from the available records is not less than 10% of the calculated PBR, and therefore cannot be considered insignificant and approaching the ZMRG. This is a strategic stock because the fin whale is listed as an endangered species under the ESA. A Recovery Plan for fin whales has been prepared and is currently awaiting legal clearance.

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MINKE WHALE (*Balaenoptera acutorostrata*): Canadian East Coast Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Minke whales have a cosmopolitan distribution in polar, temperate and tropical waters. In the North Atlantic there are four recognized populations — Canadian East Coast, west Greenland, central North Atlantic, and northeastern North Atlantic (Donovan 1991). These four population divisions were defined by examining segregation by sex and length, catch distributions, sightings, marking data and pre-existing ICES boundaries. However, there were very few data from the Canadian East Coast population.

Minke whales off the eastern coast of the United States are considered to be part of the Canadian East Coast stock, which inhabits the area from the eastern half of the Davis Strait (45º~~E~~W) to the Gulf of Mexico. The relationship between this and the other three stocks is uncertain. It is also uncertain if there are separate stocks within the Canadian East Coast stock.

The minke whale is common and widely distributed within the U.S. Atlantic Exclusive Economic Zone (EEZ) (CETAP 1982). There appears to be a strong seasonal component to minke whale distribution. Spring and summer are times of relatively widespread and common occurrence, and during this time they are most abundant in New England waters. During fall in New England waters, there are fewer minke whales, while during winter, the species appears to be largely absent. Like most other baleen whales, the minke whale generally occupies the continental shelf proper, rather than the continental shelf edge region. Records summarized by Mitchell (1991) hint at a possible winter distribution in the West Indies and in mid-ocean south and east of Bermuda. As with several other cetacean species, the possibility of a deep-ocean component to distribution exists but remains unconfirmed.

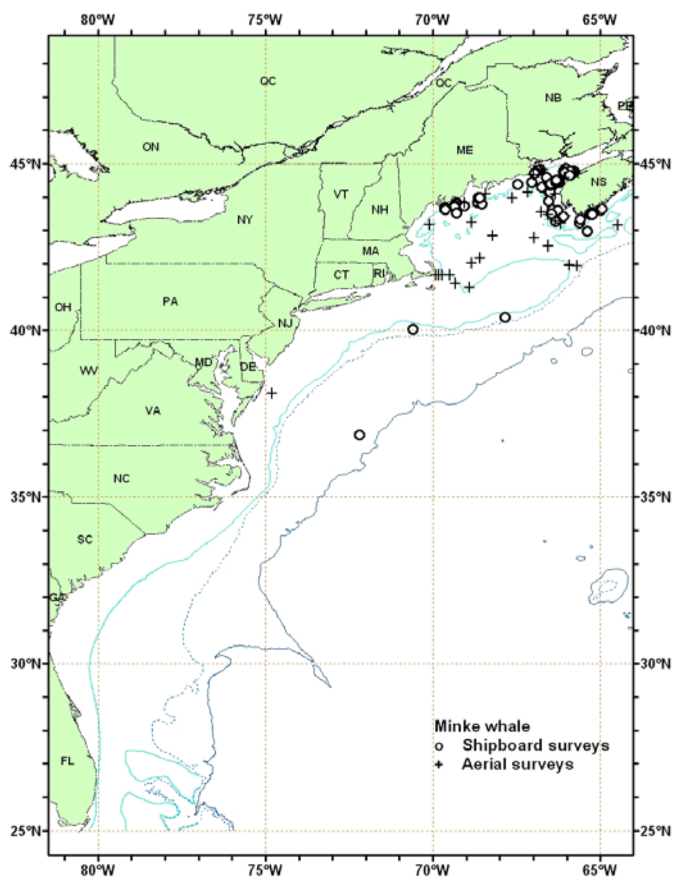

Figure 1. *Distribution of minke whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1998, 1999, and 2004. Isobaths are the 100m, 1000m and 4000m depth contours.*

POPULATION SIZE

The total number of minke whales in the Canadian East Coast population is unknown. However, seven estimates are available for portions of the habitat — a 1978-1982 estimate, a shipboard survey estimate from the summers of 1991 and 1992, a shipboard estimate from June-July 1993, an estimate made from a combination of shipboard and aerial surveys conducted during July to September 1995, an aerial survey estimate of the entire Gulf of St. Lawrence conducted in August to September 1995, an aerial survey estimate from the northern Gulf of St. Lawrence conducted during July and August 1996, and an aerial/shipboard survey conducted from Georges Bank to the mouth of the Gulf of St. Lawrence during July and August 1999 (Table 1; Figure 1).

An abundance of 320 minke whales (CV=0.23) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982).

An abundance of 2,650 (CV=0.31) minke whales was estimated from two shipboard line-transect surveys conducted during July to September 1991 and 1992 in the northern Gulf of Maine-lower Bay of Fundy region. This abundance estimate is a weighted-average of the 1991 and 1992 estimates, where each annual estimate was weighted by the inverse of its variance, using methods as described in Palka (1995).

An abundance of 330 minke whales (CV=0.66) was estimated from a June and July 1993 shipboard line-transect sighting survey conducted principally between the 200 and 2,000m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (~~Anon.~~NMFS~~ ~~ 1993).

An abundance of 2,790 (CV=0.32) minke whales was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Palka Unpub~~.~~lished Ms.). Total track line length was 32,600 km. The ships covered waters between the 50 and 1000 fathom isobaths, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour. Data collection and analysis methods were described in Palka (1996).

Kingsley and Reeves (1998) estimated there were 1,020 (CV=0.27) minke whales in the entire Gulf of St. Lawrence in 1995 and 620 (CV=0.52) in the northern Gulf of St. Lawrence in 1996 (Table 1). During the 1995 survey, 8,427km of track lines were flown in an area of 221,949 km^2 during August and September. During the 1996 survey, 3,993km of track lines were flown in an area of 94,665 km^2 during July and August. Data were analyzed using Quenouille's jackknife bias reduction procedure on line-transect methods that model the left truncated sighting curve. These estimates were uncorrected for visibility biases such as *g(0)*, the probability of detecting a group on the track line.

An abundance of 2,998 (CV=0.19) minke whales was estimated from a July to August 1999 sighting survey conducted by a ship and airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence (Table 1; D. Palka, Unpub~~.~~lished Ms.). Total track line length was 8,212km. Using methods similar to that used in the above 1995 Virginia to Gulf of St. Lawrence survey, shipboard data were analyzed using the modified direct duplicate method that accounts for school size bias and *g(0)*. Aerial data were not corrected for *g(0)* (Palka 2000).

The best available current abundance estimate for minke whales, 2,998~~3,618~~ (CV=0.19~~86~~), ~~is the sum of~~ the 1999 Georges Bank to Gulf of St. Lawrence estimate ~~(2,998 (CV=0.19)) and the 1996 northern Gulf of St. Lawrence estimate (620 (CV=0.52))~~, because this~~ese~~ survey~~s~~ is~~are~~ recent ~~and provided the most complete coverage of the known habitat~~.

Month/Year	Area	N_{best}	CV
~~Jul-Aug 1996~~	~~northern Gulf of St. Lawrence~~	~~620~~	~~0.52~~
July-Aug 1999	Georges Bank to mouth of Gulf of St. Lawrence	2,998	0.19
~~Jul-Aug 1996 + July-Aug 1999~~	~~Georges Bank to Gulf of St. Lawrence (SUM OF ROWS 1 AND 2)~~	~~3,618~~	~~0.18~~

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for minke whales is 2,998~~3,618~~ (CV=0.19). The minimum population estimate for the Canadian East Coast minke whale is 2,559~~3,113~~.

Current Population Trend

There are insufficient data to determine population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include: females mature when 6-8 years old; pregnancy rates are approximately 0.86 to 0.93; thus, the calving interval is between 1 and 2 years; calves are probably born during October to March, after 10 to 11 months gestation; nursing lasts for less than 6 months; maximum ages are not known, but for Southern Hemisphere minke whales the maximum age appears to be about 50 years (Katona *et al.* 1993; IWC 1991).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 3,113. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened, or stocks of unknown status, relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the Canadian east coast minke whale is 26~~31~~.

ANNUAL HUMAN-CAUSED MORTALITY AND INJURY

Recent minke whale takes have been observed in or attributed to the Northeast bottom trawl, Gulf of Maine and mid-Atlantic lobster trap/pot, and unknown fisheries; although not all takes have resulted in mortalities (Tables 2 to 6~~5~~).

Data to estimate the mortality and serious injury of minke whales come from the U.S. Sea Sampling Program and from records of strandings and entanglements in U.S. waters. Estimates using the Sea Sampling Program data are discussed by fishery under the Fishery Information section below (Table 2). Strandings and entanglement records are discussed under the lobster trap fishery, and "Unknown Fisheries" within the Fishery Information section and under the Other Mortality section (Tables 3~~2~~ to 6~~5~~). Ship strike mortalities and serious injuries are discussed under the Other Mortality section (Table 5~~s 3 and 4~~). For the purposes of this report, only those strandings and entanglement records considered confirmed human-caused mortalities or serious injuries are shown in Tables ~~3~~ 3 through 5~~and 4~~.

During 2000~~1999~~ to 2004~~3~~, the U.S. total annual estimated average human-caused mortality was 2.8~~3.2~~ minke whales per year (CV=unknown), plus a pending bycatch estimate from the Northeast bottom trawl fishery. This is derived from three components: ~~0~~an unknown number of minke whales per year from U.S. fisheries using observer data (estimate pending), 2.6~~3.2~~ minke whales per year (unknown CV) from U.S. fisheries using strandings and entanglement data, and 0.2~~0~~ minke whales per year from ship strikes. During 1997 to 2001, there were no confirmed mortalities or serious injuries in Canadian waters as reported by the various, small-scale stranding and observer data collection programs in Atlantic Canada. No additional information ~~are~~ is available on Canadian mortalities from 2002 to present.

Fishery Information

——Detailed fishery information is reported in Appendix III.

Earlier Interactions

Little information is available about fishery interactions that took place before the 1990's. Read (1994) reported that a minke whale was found dead in a Rhode Island fish trap in 1976. A minke whale was caught and released alive in the Japanese tuna longline fishery in 3,000 m of water, south of Lydonia Canyon on Georges Bank, in September 1986 (Waring *et al.* 1990).

Two minke whales were observed taken in the Northeast sink gillnet fishery between 1989 and the present. The take in July 1991, south of Penobscot Bay, Maine resulted in a mortality, and the take in October 1992, off the coast of New Hampshire near Jeffreys Ledge, was released alive.

A minke whale was trapped and released alive from a herring weir off northern Maine in 1990.

Four minke whale mortalities were observed in the Atlantic pelagic drift gillnet fishery during 1995 so the estimated annual fishery-related mortality and serious injury was 4.5 (CV=0).

In an Atlantic tuna purse seine off Stellwagen Bank, one minke whale was reported caught and released uninjured in 1991(D. Beach, NMFS NE Regional Office, pers. comm.) and in 1996. The minke caught during 1991 escaped after a crew member cut the rope that was wrapped around the tail. The minke whale caught during 1996 escaped by diving beneath the net.

One minke whale, reported in the strandings and entanglement database, maintained by the New England Aquarium and the Northeast Regional Office/NMFS, was taken in a 6-inch gill net on 06 July 1998 off Long Island, New York. This take was assigned to the mid-Atlantic ~~coastal~~ gillnet fishery. No other minke whales have been taken from this fishery during observed trips in 1993 to 2004~~3~~.

U.S.

Northeast Bottom Trawl

The fishery is active in New England waters in all seasons. Detailed fishery information is reported in Appendix III. One freshly dead minke whale was caught in 2004 on the northeast tip of Georges Bank in US waters (Table 2). The expanded bycatch estimate is pending. It is expected the estimate will be completed before the Atlantic trawl Take Reduction Team meeting in September 2006.

Gulf of Maine and mid-Atlantic Lobster Trap/Pot Fishery

The strandings and entanglement database, maintained by the New England Aquarium and the Northeast Regional Office/NMFS, reported 7 minke whale mortalities and serious injuries that were attributed to the lobster fishery during 1990 to 1994; 1 in 1990 (may be serious injury), 2 in 1991 (1 mortality and 1 serious injury), 2 in 1992 (both mortalities), 1 in 1993 (serious injury) and 1 in 1994 (mortality) (1997 List of Fisheries 62FR33, January 2, 1997). The 1 confirmed minke whale mortality during 1995 was attributed to the lobster fishery. No confirmed mortalities or serious injuries of minke whales occurred in 1996. From the 4 confirmed 1997 records, 1 minke whale mortality was attributed to the lobster trap fishery. One minke whale was disentangled and released alive from lobster gear on 21 August 2002 (Table 4~~2~~). One minke whale mortality was attributed to this fishery for 2003 (Tables 3 and 5~~4~~). Annual mortalities due to this fishery, as determined from strandings and entanglement records that have been audited, were 1 in 1991, 2 in 1992, 1 in 1994, 1 in 1995, 0 in 1996, 1 in 1997, 0 in 1998 to 2002, ~~and~~ 1 in 2003, and 0 in 2004. Estimated average annual mortality related to this fishery during 2000~~1999~~ to 2004~~3~~ was 0.2 minke whales per year (Table 3).

Unknown Fisheries

The strandings and entanglement database, maintained by the New England Aquarium and the Northeast Regional Office/NMFS, included 36 records of minke whales within U.S. waters for 1975-1992. The gear included unspecified fishing nets, unspecified cables or lines, fish traps, weirs, seines, gillnets, and lobster gear. A review of these records is not complete. One confirmed entanglement was an immature female minke whale, entangled with line around the tail stock, that came ashore on the Jacksonville, Florida jetty on 31 January 1990 (R. Bonde, USFWS, Gainesville, FL, pers. comm.).

The audited NE Regional Office/NMFS entanglement/stranding database contains records of minke whales, of which the confirmed mortalities and serious injuries from the last five years are reported in Table 5~~4~~. Mortalities (and serious injuries) that were likely a result of a fishery interaction with an unknown fishery include 3 (0) in 1997, 3 (0) in 1999, 1 (1) in 2000, 2 (0) in 2001, 2 (0) in 2002, 4 (0) in 2003, 2 (0) in 2004 and 0 (0) in other years. The examination of the minke entanglement records from 1997 indicate that 4 out of 4 confirmed records of mortality are likely a result of fishery interactions, one attributed to the lobster pot fishery (see above), and three not attributed to any particular fishery because the reports do not contain the necessary details. Of the 5 mortalities in 1999, 2 were attributed to an unknown trawl fishery and 3 to some other fishery. Of the 2 interactions with an unknown fishery in 2000, 1 was a mortality and 1 was a serious injury. In 2001, of the 2 confirmed fishery interactions, both were with an unknown fishery. In 2002, there were 2 mortalities in an unknown fishery. In 2003, 4 of 5 confirmed mortalities were due to interactions with an unknown fishery. In 2004, of the three confirmed mortalities, two were due to an interaction with an unknown fishery ~~-~~(Tables 3 and 5~~4~~).

In general, an entangled or stranded cetacean could be an animal that is part of an expanded bycatch estimate from an observed fishery and thus it is not possible to know if an entangled or stranded animal is an additional mortality. During 1997 to 2003, no minke whales were observed taken in any fishery that participated in the Sea Sampling Program, therefore, the strandings from 1997 to 2003 that were a~~where~~ mortality ~~was~~ due to a fishery interaction can be added into the human-caused mortality estimate. However, during 2004 a minke whale was observed in the Northeast bottom trawl fishery, but the total bycatch estimate is presently not available. When this bycatch estimate is complete the 2004 unknown fishery mortalities will be re-evaluated to insure takes are not double counted. Until that estimate is complete, ~~D~~during 2000~~1999~~ to 2004~~3~~, as determined from strandings and entanglement records, the estimated average annual mortality is ~~0.4 minke whales per year in unknown trawl fisheries, and~~ 2.4~~6~~ minke whales per year in unknown fisheries (Table 3).

CANADA

In Canadian waters, information about minke whales interacting with fishing gear is not well quantified or recorded, though some records are available. Read (1994) reported interactions between minke whales and gillnets in Newfoundland and Labrador, cod traps in Newfoundland, and herring weirs in the Bay of Fundy. Hooker ~~et al.~~*et al.* (1997) summarized bycatch data from a Canadian fisheries observer program that placed observers on all foreign fishing vessels operating in Canadian waters, on between 25% and 40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. During 1991 through 1996, no minke whales were observed taken.

Herring Weirs

During 1980 to 1990, 15 of 17 minke whales were released alive from herring weirs in the Bay of Fundy. Due to the formation of a cooperative program between Canadian fishermen and biologists it is expected that now most minke whales will be able to be released alive. During January 1991 to September 2002, 26 minke whales were trapped in herring weirs in the Bay of Fundy. Of these 26, 1 died (H. Koopman, pers. comm.) and several (number unknown) were released alive and unharmed (A. Westgate, pers. comm.).

Other Fisheries

Six minke whales were reported entangled during 1989 in the now non-operational groundfish gillnet fishery in Newfoundland and Labrador (Read 1994). One of these animals escaped and was still towing gear, the remaining 5 animals died.

Salmon gillnets in Canada, now no longer being used, had taken a few minke whales. In Newfoundland in 1979, one minke whale died in a salmon net. In Newfoundland and Labrador, between 1979 and 1990, it was estimated that 15% of the Canadian minke whale takes were in salmon gillnets. A total of 124 minke whale interactions were documented in cod traps, groundfish gillnets, salmon gillnets, other gillnets and other traps. The salmon gillnet fishery ended in 1993 as a result of an agreement between the fishermen and North Atlantic Salmon Fund (Read 1994).

Five minke whales were entrapped and died in Newfoundland cod traps during 1989. The cod trap fishery in Newfoundland closed in 1993 due to the depleted groundfish resources (Read 1994).

Table 2. Summary of the incidental mortality of minke whales (*Balaenoptera acutorostrata*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [a]	Observer Coverage [b]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northeast Bottom Trawl	00-04	TBD	Obs. Data	.004, .004, .021, .028, .045	0, 0, 0, 0, 1	TBD[c]	TBD[c]	TBD[3]
Total								TBD[3]

Table 2. Summary of the incidental mortality of minke whales (*Balaenoptera acutorostrata*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [a]	Observer Coverage [b]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality

a) Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program.

b) Observer coverage for trawl fishery is measured in trips.

c) Analysis of bycatch mortality attributed to the Northeast bottom trawl fishery for the years 2000-2004 is in progress. The estimates will not be reported until the analysis and scientific review is complete. Complete review is anticipated prior to the commencement of the Atlantic trawl take reduction team in September 2006.

Table 3. From strandings and entanglement data, summary of confirmed incidental mortalities and serious injuries of minke whales (*Balaenoptera acutorostrata*) by commercial fishery: includes years sampled (Years), number of vessels active within the fishery (Vessels), type of data used (Data Type), mortalities and serious injuries assigned to this fishery (Assigned Mortality), and mean annual mortality and serious injuries. See Table 4 for details. (NA=Not Available)					
Fishery	Years	Vessels	Data Type [a]	Assigned Mortality	Mean Annual Mortality
GOM and mid-Atlantic Lobster Trap/Pot	~~99-03~~ 00-04	1997=6880 2000=7539 licenses	Entanglement & Strandings	~~0,~~ 0, 0, 0, 1, 0	0.2
~~Unknown Trawl~~	~~99-03~~	~~NA~~	~~Entanglement & Strandings~~	~~2, 0, 0, 0, 0~~	~~0.4~~
Unknown Fisheries	~~99-03~~ 00-04	NA	Entanglement & Strandings	~~3,~~ 2, 2, 2, 4, 2	2.4~~6~~
TOTAL					2.6~~3.2~~ (unk)
a. Data from records in the entanglement and strandings data base maintained by the New England Aquarium and the Northeast Regional Office/NMFS (Entanglement and Strandings).					

Table 4~~2~~. Summary of minke whales (*Balaenoptera acutorostrata*) released alive, by commercial fishery, years sampled (Years), ratio of observed mortalities recorded by on-board observers to the estimated mortality (Ratio), the number of observed animals released alive and injured (Injured), and the number of observed animals released alive and uninjured (Uninjured). (N/A = Not Available)				
Fishery	Years	Ratio	Injured	Uninjured
Lobster trap pot	None	NA[1]	1[a]	0
a. Minke whale disentangled and released alive from lobster gear by owner of gear on 21 August 2002 near Mount Desert Island, ME.				

Table 5~~4~~. Summarized records of mortality and serious injury likely to result in mortality. Canadian East Coast stock of minke whales, January 2000~~1999~~ - December 2004~~3~~. This listing includes only confirmed records related to U.S. commercial fisheries and/or ship strikes in U.S. waters. Causes of mortality or injury, assigned as primary or secondary, are based on records maintained by NMFS/NER and NMFS/SER.						
Date[a]	Report Type[b]	Sex, age, ID	Location[a]	Assigned Cause[c]: P=primary, S=secondary		Notes
				Ship strike	Entang./ Fsh.inter	
~~5/22/99~~	~~mortality~~	~~female, 4.6m~~	~~Cape Lookout Bight (34E 41'N 76E 54'W)~~		~~P~~	~~Unknown fishery. Fresh open wounds around fluke and line marks from pectoral fins through mouth.~~

~~6/16/99~~	~~mortality~~	~~female, 6.9m~~	~~Orleans, MA (41E 48'N 65E 56'W)~~		~~P~~	~~Unknown fishery. Extensive rope markings with hemorrhaging.~~
~~7/3/99~~	~~mortality~~	~~female, 4.1m~~	~~Sakonnet River, RI (41E48'N 71E12'W)~~		~~P~~	~~Trawl fishery. 4.5 inch stretched mesh driven into rostrum.~~
~~8/2/99~~	~~mortality~~	~~female, 4.1m~~	~~Point Judith Light, RI (41E23'N 71E28'W)~~		~~P~~	~~Trawl fishery. 6 inch stretched mesh tightly wrapped around rostrum.~~
~~10/2/99~~	~~mortality~~	~~female, 7.2m~~	~~Provincetown, MA (42E03'N 70E21'W)~~		~~P~~	~~Unknown fishery. Rope marks on left gape of mouth, left pectoral fin, caudal peduncle, and dorsal and ventral surfaces of fluke blades.~~
8/11/00	serious injury	unk sex and size	Port Clyde, ME (43º55'N 69º11'W)		P	Unknown fishery. Dark line with several bullet buoys. Unusual minke behavior - whale probably anchored. No gear recovered.
10/3/00	mortality	unk sex and size	Rockland ME (44º05'N 69º01'W)		P	Unknown fishery. Very fresh carcass with fresh entanglement wounds on tail stock. No gear recovered.
8/17/01	mortality	male, 3.9m	Middletown, RI (41º28'N 71º15'W)		P	Unknown fishery. Severe rope entanglement around mouth and rostrum caused malnutrition and infection.
12/13/01	mortality	unk sex, 7m (est)	Massachusetts Bay (42º21'N 70º43'W)		P	Unknown fishery. Pictures show evidence of fairly fresh entanglement marks on tail stock and across tail flukes. No gear recovered.
7/17/02	mortality	female, 4.6m (est)	Bar Harbor, ME (44º18.22'N 68º07.43'W)		P	Unknown fishery. Carcass had a rope scar on the peduncle with associated hemorrhaging. Additional bruising around the epiglottis and larynx. No gear recovered.

10/15/02	mortality	female, 5.1m	Gloucester, MA (42º36'N 70º39W)		P	~~Unknown fishery.~~ Whale was entangled through the mouth and around the pectoral flippers. Gear from state water lobster fishery was still on the whale.
5/24/03	mortality	male, 7.6m	Glouster, MA (42º40.8'N 70º39.6'W)		P	Unknown fishery. Line marks on head and dorsal fin, no line present. Cut across back anterior to dorsal fin. No gear recovered.
5/31/03	mortality	female, 3.6m (est)	Martha's Vineyard, MA (41º21.0'N 70º47.5'W)		P	Unknown fishery. Whale stranded live wrapped in about 15 feet of ~~2-3~~5.5 inch mesh netting, probably trawl gear.
8/9/03	mortality	unk sex, 3.5m (est)	Harwich, MA (41º37.3'N 70º03.0'W)		P	Unknown fishery. Hemorrhaging in areas with net marks on whale. Gear not found.
6/~~20~~28/03	mortality	male, 9.1m	Chatham, MA (41º40'N 69º55'W)		P	Lobster fishery. Wrapped in lobster gear.
9/13/03	mortality	female, 6m (est)	Maine (43º42'N 69º58'W)		P	Unknown fishery. Fresh dead. External chaffing marks and belly slit open. No gear recovered.
5/~~30~~6/04	mortality	female, 7.7m	Martha's Vinyard, MA (41º21'N 70º40'W)		P	Unknown fishery. Constricting line marks on peduncle. Indications of drowning from internal exam.
6/1/04	mortality	female, 6.5m	Chatham, MA (41º 41'N 69º56'W)	P		Ship strike. Large area of subdermal hemorrhaging.
7/19/04	mortality	female, 7.9m	Eastham, MA (41º54'N 69º58'W)		P	Unknown fishery. Extensive entanglement markings. No gear recovered.

~~1.~~a. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.
~~2.~~b. National guidelines for determining what constitutes a serious injury have not been finalized. Interim criteria as established by NERO/NMFS (62 FR 33, Jan. 2, 1997) have been used here. Some assignments may change as new information becomes available and/or when national standards are established.
c. Assigned cause based on best judgement of available data. Additional information may result in revisions.

Other Mortality

Minke whales have been and are still being hunted in the North Atlantic. From the Canadian East Coast population, documented whaling occurred from 1948 to 1972 with a total kill of 1,103 animals (IWC 1992). Animals from other North Atlantic minke populations are presently still being harvested at low levels.

U.S.

Minke whales inhabit coastal waters during much of the year and are subject to collision with vessels. According to the NMFS/NER marine mammal entanglement and stranding database, on 7 July 1974, a necropsy of a minke whale suggested a vessel collision occurred; on 15 March 1992, a juvenile female minke whale with propeller scars was found floating east of the St. Johns Channel entrance (R. Bonde, USFWS, Gainesville, FL, pers. comm.); and on 15 July 1996 the captain of a vessel reported they hit a minke whale offshore of Massachusetts. After reviewing this record, it was concluded the animal struck was not a serious injury or mortality. On 12 December 1998, a minke whale was struck and presumed killed by a whale watching vessel in Cape Cod Bay off Massachusetts.

During 1999 to 2003, no minke whale was confirmed struck by a ship. During 2004, one minke whale mortality was contributed to a ship strike (Table 5).~~, t~~Thus, during 2000 to 2004, as determined from stranding and entanglement records, the estimated~~there is an~~ annual average is 0.2~~of 0.0~~ minke whales per year struck by ships ~~(Table 4)~~.

In October 2003 an Unusual Mortality Event was declared involving minke whales and harbor seals along the coast of Maine. Two of the seven criteria established to designate such an event were met by these species. Specifically, there was a marked increase in mortalities when compared with historical records and the mortalities were occurring in a localized area of the Maine coast. From September 11-30, 2003, nine minke whales were reported along the mid-coast to southern Maine. Results from analyses for biotoxins failed to show the presence of either of the biotoxins, saxitoxin or domoic acid (by ELISA and Receptor Binding Assay). Most whale carcasses reported that were examined appeared to be in good body condition immediately prior to death. Since October 2003, the number of minke whale stranding reports has returned to normal.

CANADA

The Nova Scotia Stranding Network documented whales and dolphins stranded between 1991 and 1996 on the coast of Nova Scotia (Hooker ~~et al.~~*et al.* 1997). Researchers with the Dept. of Fisheries and Oceans, Canada documented strandings on the beaches of Sable Island (Lucas and Hooker 2000). Sable Island is approximately 170 km southeast of mainland Nova Scotia. Lucas and Hooker (2000) report 4 minke whales stranded on Sable Island between 1970 and 1998, 1 in spring 1982, 1 in January 1992, and a mother/calf in December 1998. On the mainland of Nova Scotia, a total of 7 reported minke whales stranded during 1991 to 1996. The 1996 stranded minke whale was released alive off Cape Breton on the Atlantic Ocean side, the rest were found dead. All the minke whales stranded between July and October. One was from the Atlantic Ocean side of Cape Breton, 1 from Minas Basin, 1 was at an unknown location, and the rest stranded in the vicinity of Halifax, Nova Scotia. It is unknown how many of the strandings can be attributed to fishery interactions.

Whales and dolphins stranded between 1997 and 2004 on the coast of Nova Scotia as recorded by the Marine Animal Response Society (MARS) and the Nova Scotia Stranding Network are as follows (Table 6~~5~~): 4 minke whales stranded in 1997 (1 in June and 3 in July), 0 documented strandings in 1998 to 2000, 1 in September 2001, 4 in 2002 (1 in July, 1 in August, and 2 in November), 2 in 2003 (1 in August and 1 in October) and 0 in 2004.

Table 6~~5~~. Documented number of stranded minke whales along the coast of Nova Scotia during 2000~~1999~~ to 2004~~3~~ by year, according to records maintained by the Canadian Marine Animal Response Society.

Area	Year					
	2000	2001	2002	2003	2004	Total
Nova Scotia	0	1	4	3	0	8

STATUS OF STOCK

The status of minke whales, relative to OSP, in the U.S. Atlantic EEZ is unknown. The minke whale is not listed as endangered under the Endangered Species Act (ESA). The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock cannot be determined until the trawl bycatch mortality analysis is complete (Table 2).

~~This is not a strategic stock because estimated fishery-related mortality and serious injury do not exceed PBR and the minke whale is not listed as a threatened or endangered species under the ESA.~~

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RISSO'S DOLPHIN (*Grampus griseus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Risso's dolphins are distributed worldwide in tropical and temperate seas. They generally have an oceanic range, and occur along the Atlantic coast of North America from Florida to eastern Newfoundland (Leatherwood *et al*.~~,~~ 1976; Baird and Stacey 1990). Off the northeast ~~USA~~U.S. coast, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank during the spring, summer, and autumn (CETAP 1982; Payne *et al*.~~,~~ 1984). In winter, the range begins at the ~~mid~~mid-Atlantic bight and extends further into oceanic waters (Payne *et al*.~~,~~ 1984). In general, the population occupies the ~~mid~~mid-Atlantic continental shelf edge year round, and is rarely seen in the Gulf of Maine (Payne *et al*.~~,~~ 1984). During 1990, 1991 and 1993, spring/summer surveys conducted in continental shelf edge and deeper oceanic waters had sightings of Risso's dolphins associated with strong bathymetric features, Gulf Stream warm-core rings, and the Gulf Stream north wall (Waring *et al*.~~,~~ 1992; Waring 1993). There is no information on stock differentiation of Risso's dolphin in the western North Atlantic.

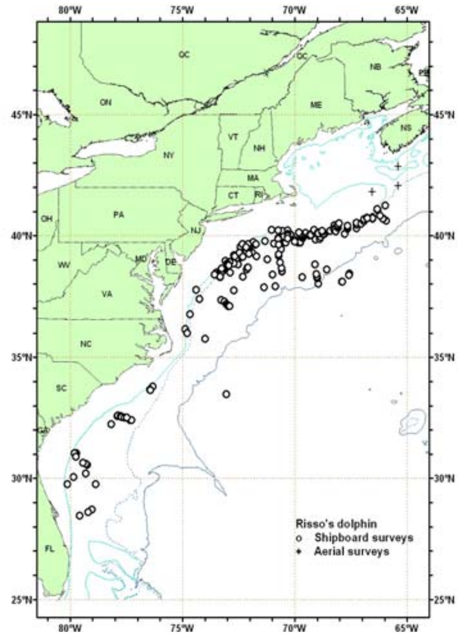

Figure 1. *Distribution of Risso's dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1998, 1999, and 2004. Isobaths are 100 m, 1,000 m, and 4,000m*

POPULATION SIZE

Total numbers of Risso's dolphins off the U.S. or Canadian Atlantic coast are unknown, although eight estimates from selected regions of the habitat do exist for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas (Figure 1). An abundance of 4,980 Risso's dolphins (CV=0.34) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). An abundance of 11,017 (CV=0.58) Risso's dolphins was estimated from a June and July 1991 shipboard line transect sighting survey conducted primarily between the 200 and 2,000 m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998). An abundance of 6,496 (CV=0.74) and 16,818 (CV=0.52) Risso's dolphins was estimated from line transect aerial surveys conducted from August to September 1991 using the Twin Otter and AT-11, respectively (~~Anon.~~NMFS 1991). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, therefore should not be used for PBR determinations. Further, due to changes in survey methodology these data should not be used to make comparisons to more current estimates.

An abundance of 212 (CV=0.62) Risso's dolphins was estimated from a June and July 1993 shipboard line transect sighting survey conducted principally between the 200 and 2,000m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (~~Anon.~~NMFS 1993). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993). Estimates include school-size bias, if applicable, but do not include corrections for *g(0)* or dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 5,587 (CV=1.16) Risso's dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al.* ~~review~~Unpub~~.~~lished Ms.). Total track line length was 32,~~600 km~~600 km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the ~~mid~~mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour line. Data collection and analysis methods used were described in Palka (1996).

An abundance of 18,631 (CV=0.35) Risso's dolphins was estimated from a line transect sighting survey conducted during 6 July ~~6~~ to 6 September ~~6,~~ 1998 by a ship and plane that surveyed 15,900km of track line in waters north of Maryland (38º~~E~~ N) (Figure 1; Palka *et al.* in Unpub~~.~~ lished Ms.). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 10,479 (CV=0.51) Risso's dolphins was estimated from a shipboard line transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 5,570 km of track line in waters south of Maryland (38º~~E~~N) (Figure 1; Mullin ~~in review~~and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993) where school size bias and ship attraction were accounted for.

The best ~~available~~ 1998 abundance estimate for Risso's dolphins, 29,110 (CV=0.29), is the sum of the estimates from the two 1998 U.S. ~~USA~~Atlantic surveys where the estimate from the northern ~~USA~~ U.S. Atlantic is 18,631 (CV=0.35) and from the southern U.S. ~~USA~~ Atlantic is 10,479 (CV=0.51). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat.

An abundance of 22,389 (CV=0.82) for Risso's dolphins was estimated from a line transect sighting survey conducted during 12 June ~~12~~ to 4 August ~~4,~~ 2004 by a ship and plane that surveyed 10,761 km of track line in waters ~~north of~~ north of Maryland (~~about~~ 38ºN^{0}) to the Bay of Fundy (~~about~~ 45ºN^{0}) (Figure 1; Palka Unpub~~.~~ lished Ms.). Shipboard data were collected using the two independent team line transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and *g(0)*, the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for *g(0)* and biases due to school size and other potential covariates (Figure 1; Palka Unpublished~~.~~ Ms.).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths ~~∃~~ > 50m) between Florida and Maryland (27.5 and 38 ºN latitude) was conducted during June-August 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf stream front in the ~~mid~~mid-Atlantic. The survey included 5,659 km of trackline, and there ~~were~~was a total of 473 cetacean sightings. Sightings were most frequent in waters ~~N~~north of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias (*g(0)*) and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka, 1995; Buckland *et al.* 2001). The resulting abundance estimate for Risso's dolphins between Florida and Maryland was 5,426 (CV =0.54).

The best 2004 abundance estimate for Risso's dolphins is the sum of the estimates from the two 2004 U.S. Atlantic surveys, ~~27~~20,~~815~~ 479 (CV=0.~~67~~59), where the estimate from the northern U.S. Atlantic is ~~22,389~~15.053 (CV=0.~~82~~78), and from the southern U.S. Atlantic is 5,426 (CV =0.54). This joint estimate is considered best because together these two surveys have the most complete coverage of the population's ~~species'~~ habitat.

Table 1. Summary of abundance estimates for the western North Atlantic Risso's dolphin. Month, year, and area covered during each abundance survey, resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	18,631	0.35
Jul-Aug 1998	Florida to Maryland	10,479	0.51
Jul-Sep 1998	~~Gulf of St. Lawrence to~~ Florida to Gulf of St. Lawrence (COMBINED)	29,110	0.29
Jun-Aug 2004	Maryland to Bay of Fundy	~~22,389~~15,053	0.~~82~~78
Jun-Aug 2004	Florida to Maryland	5,426	0.54
Jun-Aug 2004	~~Bay of Fundy to~~ Florida to Bay of Fundy (COMBINED)	~~27,815~~20,479	0.~~67~~59

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for Risso's dolphins is ~~27,815~~20,479 (CV=0.67). The minimum population estimate for the western North Atlantic Risso's dolphin is ~~16,645~~12,920.

Current Population Trend

There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al*.~~,~~ 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is ~~16~~12,~~645~~920. The maximum productivity rate is 0.04, the default value for cetaceans (Barlow *et al*.~~,~~ 1995). The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.48 because the CV of the average mortality estimate is between 0.3 and 0.6 (Wade and Angliss 1997). PBR for the western North Atlantic Risso's dolphin is ~~160~~124.

ANNUAL HUMAN-CAUSED MORTALITY

Total annual estimated average fishery-related mortality or serious injury to this stock during ~~1999-2003~~2000-2004 was ~~51~~52 Risso's dolphins (CV= 0.34); Table 2).

Fishery Information

Detailed fishery information is reported in Appendix III.

Earlier Interactions

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the U.S. With implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA) in that year, an observer program was established which ~~has~~ recorded fishery data and information ~~of~~ on incidental bycatch of marine mammals. DWF effort in the U.S. Atlantic Exclusive Economic Zone (EEZ) under MFCMA has been directed primarily towards Atlantic mackerel and squid. ~~-~~From 1977 through 1982, an average of 120 different foreign vessels per year (range 102-161) operated within the US Atlantic EEZ. In 1982, there were 112 different foreign vessels; 16%, or 18, were Japanese tuna longline vessels operating along the USA east coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. Between 1983 and 1991, the numbers of foreign vessels operating within US Atlantic EEZ each year were 67, 52, 62, 33, 27, 26, 14, 13, and 9, respectively. Between 1983 and 1988, the numbers of DWF vessels included 3, 5, 7, 6, 8, and 8, respectively, Japanese longline vessels. Observer coverage on DWF vessels was 25-35% during 1977-82, and increased to 58%, 86%, 95%, and 98%, respectively, in 1983-86. From 1987-91, 100% observer coverage was maintained. Foreign fishing operations for squid and mackerel ceased at the end of the 1986 and 1991 fishing seasons, respectively. NMFS foreign-fishery observers have reported four deaths of Risso's dolphins incidental to squid and mackerel fishing activities in the continental shelf and continental slope waters between March 1977 and December 1991 (Waring *et al*. 1990; NMFS unpublished data). Three animals were taken by squid trawlers and a single animal was killed in longline fishing operations.

Data on current incidental takes in U.S. fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries ~~Science Center (NEFSC) Sea Sampling~~ Observer Program was initiated in 1989, and since that year several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and provides observer coverage of vessels fishing south of Cape Hatteras.

~~Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet fishery, pelagic pair trawl fishery, and pelagic longline fishery, but no mortalities or serious injuries have been documented in the Northeast multispecies sink gillnet, mid-Atlantic coastal gillnet, or North Atlantic bottom trawl observed fisheries.~~

~~**Pelagic Drift Gillnet**~~

~~The estimated total number of hauls in the pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls in 1991, 1992, 1993, 1994, 1995,1996, and 1998 were 233, 243, 232, 197, 164,149, and 113 respectively. In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. Further, in January 1999 NMFS issued a Final Rule to prohibit the use of driftnets (*i.e.*, permanent closure) in the North Atlantic swordfish fishery (50 CFR Part 630). Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. From 1994-1998, between 10 and 13 vessels have participated in the fishery. Observer coverage, expressed as percent of sets observed, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, 64% in 1996, and 99% in 1998. Effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year, suggested that the pelagic drift gillnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total bycatch, for each year from 1989 to 1993, were obtained using the aggregated (pooled 1989-1993) catch rates, by strata (Northridge 1996). Estimates of total annual bycatch for 1994 and 1995 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in self-reported fisheries information. Variances were estimated using bootstrap re-sampling techniques. Fifty~~In the pelagic drift gillnet fishery fifty-one Risso's dolphin mortalities were observed between 1989 and 1998. One animal was entangled and released alive. Bycatch occurred during July, September and October along continental shelf edge canyons off the southern New England coast. Estimated annual mortality and serious injury (CV in parentheses) attributable to the drift gillnet fishery was 87 in 1989 (0.52), 144 in 1990 (0.46), 21 in 1991 (0.55), 31 in 1992 (0.27), 14 in 1993 (0.42), 1.5 in 1994 (0.16), 6 in 1995 (0), 0 in 1996, no fishery in 1997, 9 in 1998 (0).

~~Since this fishery no longer exists, it has been excluded from Table 2.~~

~~**Pelagic Pair Trawl**~~

~~Effort in the pelagic pair trawl fishery increased during the period 1989 to 1993, from zero hauls in 1989 and 1990, to an estimated 171 hauls in 1991, and then to an estimated 536 hauls in 1992, 586 in 1993, 407 in 1994, and 440 in 1995, respectively. This fishery ceased operations in 1996, when NMFS rejected a petition to consider pair trawl gear as an authorized gear type in the Atlantic tuna fishery. The fishery operated from August-November in 1991, from June-November in 1992, from June-October in 1993 (Northridge 1996), and from mid-summer to November in 1994 and 1995. Fisheries Observer began in October 1992 (Gerrior *et al.* 1994), and 48 sets (9% of the total) were sampled in that season, 102 hauls (17% of the total) were sampled in 1993. In 1994 and 1995, 52% and 55%, respectively, of the sets were observed. Nineteen vessels have operated in this fishery. The fishery extends from 35ºN to 41ºN, and from 69EW to 72EW. Approximately 50% of the total effort was within a one degree square at 39ºN, 72ºW, around Hudson Canyon. Examination of the 1991-1993 locations and species composition of the bycatch, showed little seasonal change for the six months of operation and did not warrant any seasonal or areal stratification of this fishery (Northridge 1996). One~~ In the pelagic pair trawl fishery one mortality was observed in 1992. Estimated annual fishery-related mortality (CV in parentheses) attributable to the pelagic pair trawl fishery was 0.6 dolphins in 1991 (1.0), 4.3 in 1992 (0.76), 3.2 in 1993 (1.0), 0 in 1994 and 3.7 in 1995 (0.45). ~~Since this fishery no longer exists, it has been excluded from Table 2.~~

~~During the 1994 and 1995 experimental fishing seasons, fishing gear experiments were conducted to collect data on environmental parameters, gear behavior, and gear handling practices to evaluate factors affecting catch and bycatch (Goudey 1995, 1996). Results of these studies were inconclusive in identifying factors responsible for marine mammal bycatch.~~

Pelagic Longline

~~Total effort, excluding the Gulf of Mexico, for the pelagic longline fishery, based on mandatory self-reported fisheries information, was 11,279 sets in 1991, 10,311 sets in 1992, 10,444 sets in 1993, 11,082 sets in 1994, 11,493 sets in 1995, 9,864 sets in 1996, 9,499 sets in 1997, 7,589 sets in 1998, 6,786 sets in 1999, and 6,582 sets in 2000 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a; Yeung *et al.*. 2000; Yeung 2001). This annual effort has been recalculated to include those sets targeting other species in conjunction with tuna/swordfish, instead of just effort that exclusively targeted tuna/swordfish as in previous reports (Johnson *et al.* 1999; Yeung 1999a). The result is an average increase in self-reported effort of roughly 10% on the average (Yeung *et al.* 2000). The fishery has been observed from January to March off Cape Hatteras, in May and June in the entire mid-Atlantic,~~

~~and in July through December in the mid-Atlantic Bight and off Nova Scotia. This fishery has been monitored with 3-6% observer coverage, in terms of sets observed, since 1992.~~ The 1993-1997 estimated take was based on a revised analysis of ~~-~~the observed incidental take and self-reported incidental take and effort data, and replaces previous estimates for the 1990-1993 and 1994-1995 periods (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999). Further, Yeung (1999b), revised the 1992-1997 fishery mortality estimates in Johnson ~~-~~*et al.* (1999) to include seriously injured animals. The 1998, 1999~~,~~ and 2000~~-~~ bycatch estimates were from Yeung (1999a), Yeung *et al.*~~-~~(2000)~~,~~ and Yeung (2001), respectively. Most of the estimated marine mammal bycatch was from ~~US~~ U.S. Atlantic EEZ waters between South Carolina and Cape Cod. Excluding the Gulf of Mexico, from 1992 to~~-~~2000 one mortality was observed in both 1994 and 2000, and 0 in other years. The observed numbers of seriously-injured but released alive individuals from 1992 to~~-~~2000 ~~was~~were, respectively, 2, 0, 6, 4, 1, 0, 1, 1~~,~~ and 1 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a; Yeung *et al.*~~,~~ 2000; Yeung 2001)) (Table 2). Estimated annual fishery-related mortality (CV in parentheses) was 17 in 1994 (1.0), 41 in 2000 (1.0), 24 in 2001(1.0), 20 in 2002 (0.86), and 0 in 2003 and 2004 (Table 2). Seriously injured and released alive animals were estimated to be 54 (0.7) in 1992, 0 in 1993, 120 (0.57) in 1994, 103 (0.68) in 1995, 99 (1.0) in 1996, 0 in 1997, 57 (1.0) in 1998, 22 (1.0) in 1999, 23 (1.0) in 2000, 45 (0.7) in 2001, 8 (1.0) in 2002, and 40 (0.63) in 2003 and 28 in 2004 (Table 2). The annual average combined mortality and serious injury for ~~1999-2003~~ 2000-2004 is 46~~5~~ Risso's dolphins (CV =0.37~~8~~; Table2).

Northeast Sink Gillnet

Estimated annual mortalities (CV in parentheses) from this fishery are: 0 in 1999, 15 (1.06) in 2000, and 0 in 2001-2004~~2003~~ (Table 2). The 2000-2004~~1999-2003~~ average mortality in this fishery is 3 Risso's dolphins (CV =1.06).

Table 2. Summary of the incidental mortality of Risso's dolphin (*Grampus griseus*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers , the estimated annual mortality and serious injury-, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels[c]	Data Type[a]	Observer Coverage	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
~~Pelagic Longline[2] (excluding NED-E)[4]~~	~~96-00~~ ~~99-03~~	~~253, 245, 205, 193,186 70, 54, 21~~	~~Obs. Data Logbook~~	~~.03, .03, .0304, .04, .0412, .04, .02~~	~~1, 1, 1 0, 0, 0, 0 2, 199, 0, 57, 22, 233~~	~~0, 0, 01, 1, 0, 0~~	~~22, 23, 45, 8, 40~~	~~0, 41, 24, 20, 0~~	~~99, 0, 57, 22, 64, 69, 28, 40~~	~~1.0, 0, 1.0, 1.0, 1. 1.0, 1.0, 0.57, 0.68, 0.63~~	~~45 (0.38)~~
~~Pelagic Longline - NED-E area only[4]~~	~~2001-2003~~	~~180, 482, 535 sets~~	~~Obs. Data Logbook~~	~~1, 1, 1~~	~~4, 3, 0~~	~~480,0,1~~	~~4, 3, 0~~	~~0,0,1~~	~~4, 3, 1~~	~~0, 0, 0~~	~~3 (.550)~~
Pelagic~~[3]~~ Longline (excluding NED-E) ~~[10]~~[b,d]	~~,~~ 00-04	116, 98, 87, 63, 58	Obs. Data Logbook	.04, .04, .05, .09, .09	1, 6, 4, 2, 2	1, 1, 0, 0, 0	23, 45, 8, 40, 28	41, 24, 20[e], 0, 0	64, 69, 28, 40, 28	1, .57, .67, .63, 72	46 (0.37)
Pelagic Longline - NED-E area only ~~[3, 10]~~[d]	~~20~~01-~~20~~03	9, 14, 11	Obs. Data Logbook	1, 1, 1	4, 3, 0	0, 0, 1	4, 3, 0	0, 0, 1	4, 3, 1	0, 0, 0	3
Northeast ~~Multispecies~~ Sink Gillnet	~~99-03~~ 00-04	1993=349 1998=301	Obs. Data Weighout Trip Logbook	~~.046,~~ .06, .0~~5~~4, .0~~6~~2, .0~~6~~3, .06	0,0,0, 0,0	~~0,~~ 1, 0, 0, 0, 0	0, 0,0, 0,0	~~0,~~ 15, 0, 0, 0~~,~~, 0	~~0,~~ 15, 0, 0, 0,	~~0,~~ 1.06, 0, 0, 0, 0	3 (1.06)
TOTAL											52~~1~~ (0. 34)

a	Observer data (Obs. Data) are used to measure bycatch rates and the data are collected within the Northeast Fisheries Observer Program. The Observer Program~~NEFSC~~ collects landings data (Weighout), and total landings are used as a measure of total effort for the coastal gillnet fishery.
b	~~1996-1999 mortality estimates were taken from Table 9 in Yeung *et al.* (NMFS Miami Laboratory PRD 99/00-13), and exclude the Gulf of Mexico.~~ 2000 mortality estimates were taken from Table 10 in Yeung (2001).
c	Number of vessels in the fishery are based on vessels reporting effort to the pelagic longline logbook.
d	An experimental program to test effects of gear characteristics, environmental factors, and fishing practices on marine turtle bycatch rates in the Northeast Distant (NED-E) water component of the fishery was conducted from June 1, 2001-December 31, 2003. Observer coverage was 100% during this experimental fishery. Summaries are provided for the pelagic longline EXCLUDING the NED-E area in one row and for ONLY the NED in the second row~~.~~ (Garrison~~,~~ 2003; Garrison and Richards~~,~~ 2004).
e	Note that the 2002 estimate of Risso's dolphin mortality is estimated from observed mortality rates in previous years (1998-2002) due to a gap in coverage during the 3rd quarter of 2002.

Other mortality

From ~~1999-2003~~2000-2004, ~~twenty~~ thirty-~~eight~~nine Risso's dolphin strandings were recorded along the ~~USA~~U.S. Atlantic coast (NMFS unpublished data).- In eastern Canada, one Risso's dolphin stranding was reported on Sable Island, Nova Scotia from 1970-1998 (Lucas and Hooker 2000).

Risso's dolphin	2000	2001	2002	2003	2004
Maine					2
New Hampshire					
Massachusetts		1[a]	5		4[b]
Rhode Island					1
Connecticut					
New York			1		3
New Jersey	1				
Delaware					1
Maryland		1	1		1
Virginia		1			1
North Carolina		3	2	1	2
South Carolina					
Georgia					
Florida		1	1	1	3
EZ					1
TOTAL	1	7	10	2	19

a Carcass showed signs of human interaction
b One animal was mutilated, fluke cut off

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

STATUS OF STOCK

The status of Risso's dolphins relative to OSP in the ~~US~~ U.S. Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. The total fishery mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, can not be considered to be insignificant and approaching a zero mortality and serious injury rate. The 2000-2004~~3~~ average annual fishery-related mortality does not exceed PBR; therefore, this is not a strategic stock.

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~~November 2005~~April 2006

LONG-FINNED PILOT WHALE (*Globicephala melas*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of pilot whales in the w~~W~~estern Atlantic — the Atlantic or long-finned pilot whale, *Globicephala melas*, and the short-finned pilot whale, *G. macrorhynchus*. These species are difficult to identify to the species level at sea; therefore, some of the descriptive material below refers to *Globicephala* sp., and is identified as such. The species boundary is considered to be in the New Jersey to Cape Hatteras area. Sightings north of this area are likely *G. melas*.

Pilot whales (*Globicephala* sp.) are distributed principally along the continental shelf edge in the winter and early spring off the northeast U.S. coast, ~~-~~(CETAP 1982; Payne and Heinemann 1993; Abend and Smith 1999). In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters, and remain in these areas through late autumn (CETAP 1982; Payne and Heinemann 1993). In general, pilot whales occupy areas of high relief or submerged banks. They are also associated with the Gulf Stream north wall and thermal fronts along the continental shelf edge (Waring *et al.* 1992; NMFS unpublished data).

The long-finned pilot whale is distributed from North Carolina to North Africa (and the Mediterranean) and north to Iceland, Greenland and the Barents Sea (Sergeant 1962; Leatherwood *et al.* 1976; Abend 1993; Buckland *et al.* 1993a; Abend and Smith 1999). The stock structure of the North Atlantic population is uncertain (~~Anon.~~Anonymous 1993~~a~~; Fullard *et al.* 2000). Recent morphometric~~s~~ (Bloch and Lastein 1993) and genetic~~s~~ (Siemann 1994; Fullard *et al.* 2000) studies have provided little support for stock structure across the Atlantic (Fullard *et al.* 2000). However, Fullard *et al.* (2000) have proposed a stock structure that is correlated to sea surface temperature: 1) a cold-water population west of the Labrador/North Atlantic current, and 2) a warm-water population that extends across the Atlantic in the Gulf Stream.

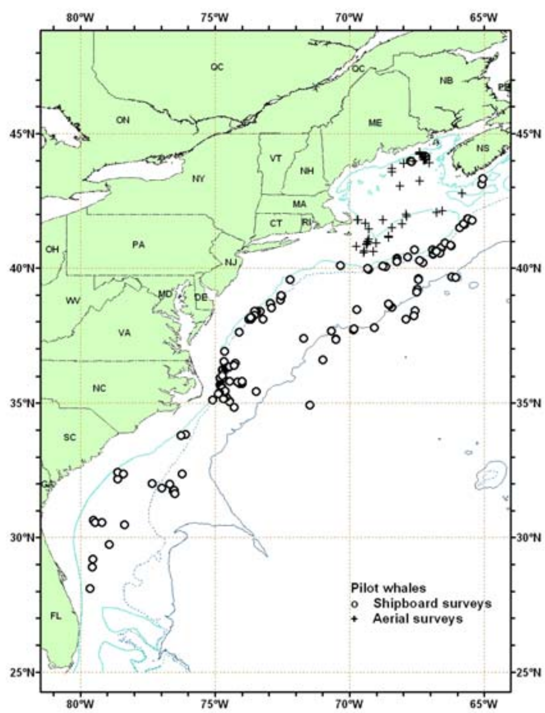

Figure 1. *Distribution of pilot whales sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1998, 1999, and 2004. Isobaths are at 100 m, 1,000 m, and 4,000 m.*

POPULATION SIZE

The total number of long-finned pilot whales off the eastern U.S. and Canadian Atlantic coast is unknown, although several estimates from selected regions of the habitat do exist for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas (Figure 1). Two estimates were derived from catch data and population models that estimated the abundance of the entire stock. Seasonal estimates are available from selected regions in U.S. waters during spring, summer and autumn 1978-1982, August 1990, June-July 1991, August-September 1991, June-July 1993, July-September 1995, July-August 1998, and June-August 2004. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* sp., both long-finned and short-finned pilot whales. One estimate is available from the Gulf of St. Lawrence.

Mitchell (1974) used cumulative catch data from the 1951-1961 drive fishery off Newfoundland to estimate the initial population size (ca. 50,000 animals).

Mercer (1975)~~,~~ used population models to estimate a population in the same region of between 43,000 and 96,000 long-finned pilot whales, with a range of 50,000-60,000 being considered the best estimate.

An abundance of 11,120 (CV=0.29) *Globicephala* sp. was estimated from an aerial survey program conducted from 1978 to 1982 i~~o~~n ~~the~~ continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova

Scotia (CETAP 1982). An abundance of 3,636 (CV=0.36) *Globicephala* sp. was estimated from a June and July 1991 shipboard line transect sighting survey conducted primarily between the 200 and 2,000 m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998). ~~–~~Abundances of 3,368 (CV=0.28) and 5,377 (CV=0.53) *Globicephala* sp. were estimated from line transect aerial surveys conducted from August to September 1991 using the Twin Otter and AT-11 aircrafts, respectively (~~Anon.Anonymous~~NMFS 1991). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than 8 years are deemed unreliable, and therefore should not be used for PBR determinations. Further, due to changes in survey methodology, these data should not be used to make comparisons to more current estimates.

An abundance of 668 (CV=0.55) *Globicephala* sp. was estimated from a June and July 1993 shipboard line~~-~~-transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (~~Anon.Anonymous~~NMFS ~~1993b~~1993a). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993b; Laake *et al.* 1993). Estimates include school-size bias, if applicable, but do not include corrections for *g(0),* the probability of detecting a group on the track line, or for dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 8,176 (CV=0.65) *Globicephala* sp. was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Palka *et al.* Unpublished Ms.~~-~~). Total track line length was 32,600 km. The ships covered waters between the 50 and 1,000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1,000 fathom isobath. Data collection and analysis methods used were described in Palka (1996).

Kingsley and Reeves (1998) obtained an abundance estimate of 1,600 long-finned pilot whales (CV=0.65) from a late August and early September aerial survey of cetaceans in the Gulf of St. Lawrence in 1995 and 1998 (Table 1). Based on an examination of long-finned pilot whale summer distribution patterns and information on stock structure, it was deemed appropriate to combine these estimates with NMFS 1995 summer survey data. The best 1995 abundance estimate for *Globicephala* sp. ~~is~~ was 9,776 (CV=0.55), the sum of the estimates from the U.S. and Canadian surveys, where the estimate from the U.S. survey ~~is~~ was 8,176 (CV=0.65) and from the Canadian was 1,600 (CV=0.65).

An abundance of 9,800 (CV=0.34) *Globicephala* sp. was estimated from a line transect sighting survey conducted during 6 July ~~6~~ to 6 September ~~6,~~ 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38º~~E~~N) (Figure 1; Table 1; Palka *et al.* Unpublished Ms.). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 5,109 (CV = 0.41) *Globicephala* sp. was estimated from a shipboard line transect sighting survey conducted between 8 July and 17 August 1998 that surveyed ~~5~~4,163 km of track line in waters south of Maryland (38º~~E~~N) (Figure 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 1993b; Laake *et al.* 1993) where school size bias and ship attraction were accounted for.

The best 1998 abundance estimate for *Globicephala* sp. is 14,909 (CV = 0.26), the sum of the estimates from the two U.S. Atlantic surveys, where the estimate from the northern U.S. Atlantic is 9,800 (CV=0.34) and from the southern U.S. Atlantic is 5,109 (CV =0.41). This estimate is a recalculation of the same data reported in previous SARs. This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat.

An abundance of 15,728 (CV=0.34) for *Globicephala* sp. was estimated from a line~~-~~-transect sighting survey conducted during 12 June ~~12~~ to 4 August ~~4,~~ 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (~~about~~ 38º~~E~~N) to the Bay of Fundy (~~about~~ 45º~~E~~N) (Figure 1; Palka Unpublished Ms.). Shipboard data were collected using the two independent team line transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and *g(0)*, the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for *g(0)* and biases due to school size and other potential covariates (Figure 1; Palka Unpublished Ms..).

A shipboard survey of the U.S. Atlantic outer continental shelf and continental slope (water depths≥~~.~~ 50m) between Florida and Maryland (27.5 and 38ºN latitude) was conducted during June-August~~,~~ 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the ~~mid~~Mid-Atlantic. The survey included 5,659 km of trackline, ~~and there wasere~~resulting in a total of 473 cetacean sightings. Sightings were most frequent in waters north of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias *g(0)* and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka, 1995; Buckland *et al.* 2001). The resulting abundance estimate for *Globicephala* sp. between Florida and Maryland was 15,411 (CV =0.43).

The best 2004 abundance estimate for *Globicephala* sp. is the sum of the estimates from the two 2004 U.S. Atlantic surveys, ~~34~~31,~~043~~ 139 (CV =0.~~29~~27), where the estimate from the northern U.S. Atlantic is ~~18,632~~15,728 (CV =0.~~40~~34), and from the southern U.S. Atlantic is 15,411 (CV =0.43). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat.

Table 1. Summary of abundance estimates for the western North Atlantic *Globicephala* sp. by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV)

Month/Year	Area	N_{best}	CV
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	9,800	0.34
Jul-Aug 1998	Florida to Maryland	5,109	0.41
Jul-Sep 1998	~~Gulf of St. Lawrence to~~ Florida to Gulf of St. Lawrence (COMBINED)	14,909	0.40
Jun-Aug 2004	Maryland to the Bay of Fundy	15,728	0.34
Jun-Aug 2004	Florida to Maryland	15,411	0.43
Jun-Aug 2004	~~Bay of Fundy to~~ Florida to Bay of Fundy (COMBINED)	31,139	0.27

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for *Globicephala* sp. is ~~34,043~~31,139 (CV = 0.~~29~~27). The minimum population estimate for *Globicephala* sp. is 24,866.

Current Population Trend

There are insufficient data to determine the population trends for *Globicephala* sp.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include those from animals taken in the Newfoundland drive fishery: calving interval 3.3 years; lactation period about 21-22 months; gestation period 12 months; births mainly from June to November; length at birth is 177 cm; mean length at sexual maturity is 490 cm for males and 356 cm for females; age at sexual maturity is 12 years for males and 6 years for females; mean adult length is 557 cm for males and 448 cm for females; and maximum age was 40 for males and 50 for females (Sergeant 1962; Kasuya *et al.* 1988). Analysis of data recently collected from animals taken in the Faroe Islands drive fishery produced higher values for all parameters (Bloch *et al.* 1993; Desportes *et al.* 1993; Martin and Rothery 1993). These differences are likely related, at least in part, to larger sample sizes and newer analytical techniques.

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for *Globicephala* sp. is 24,866. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. Stock status will be determined when trawl fishery bycatch estimates are complete. ~~The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997) and because this stock is of unknown status.~~ PBR for the western North Atlantic *Globicephala* sp. is 249.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is~~are~~ reported in ~~-~~Appendix III.

Total fishery-related mortality and serious injury cannot be estimated separately for the two species of pilot whales in the U.S. Atlantic EEZ because of the uncertainty in species identification by fishery observers. The Atlantic Scientific Review Group advised adopting the risk-averse strategy of assuming that either species might have been subject to the observed fishery-related mortality and serious injury. Preliminary fishery mortality estimates have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

Earlier Interactions

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the U.S. A fishery observer program, which has collected fishery data and information on incidental bycatch of marine mammals, was established in 1977 with the implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA). Foreign fishing operations for squid ceased at the end of the 1986 fishing season and, for mackerel, at the end of the 1991 fishing season.

During 1977-1991, observers in this program recorded 436 pilot whale mortalities in foreign-fishing activities (Waring *et al.* 1990; Waring 1995). A total of 391 pilot whales (90%) was~~ere~~ taken in the mackerel fishery, and 41 (9%) occurred during *Loligo* and *Illex* squid-fishing operations. This total includes 48 documented takes by U.S. vessels involved in joint-venture fishing operations in which U.S. captains transfer their catches to foreign processing vessels. Due to temporal fishing restrictions, the bycatch occurred during winter/spring (December to May) in continental shelf and continental shelf edge waters (Fairfield *et al.* 1993; Waring 1995); however, the majority of the takes occurred in late spring along the 100m isobath. Two animals were also caught in both the hake and tuna longline fisheries (Waring *et al.* 1990).

~~**Pelagic Drift Gillnet**~~

~~Estimates of the total bycatch from 1989 to 1993 were obtained using the aggregated (pooled 1989-1993) catch rates, by stratum (Northridge 1996). Estimates of total annual bycatch for 1994 and 1995 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in self-reported fisheries information. Variances were estimated using bootstrap re-sampling techniques.~~

Between 1989 and 1998, 87 mortalities were observed in the large pelagic drift gillnet fishery. The annual fishery-related mortality (CV in parentheses) was 77 in 1989 (0.24), 132 in 1990 (0.24), 30 in 1991 (0.26), 33 in 1992 (0.16), 31 in 1993 (0.19), 20 in 1994 (0.06), 9.1 in 1995 (0), 11 in 1996 (0.17), no fishery in 1997 and 12 in 1998 (0). ~~In January 1999 NMFS issued a Final Rule to prohibit the use of driftnets (i.e., permanent closure) in the North Atlantic swordfish fishery (50 CFR Part 630). Since this fishery no longer exists it has been excluded from Table 2. Pilot whales were taken along the continental shelf edge, northeast of Cape Hatteras in January and February. Takes were recorded at the continental shelf edge east of Cape Charles, Virginia, in June. From July to November, pilot whale takes were recorded along the southern flank of Georges Bank. Pilot whales were taken from Hydrographer Canyon along the Great South Channel to Georges Bank from July to November. Takes also occurred at the Oceanographer Canyon continental shelf break and along the continental shelf northeast of Cape~~

~~Hatteras in October-November.~~

~~**Atlantic Tuna Pelagic Pair Trawl**~~

Five pilot whale (*Globicephala* sp.) mortalities were reported in the self-reported fisheries information for the Atlantic tuna pair trawl in 1993. In 1994 and 1995 observers reported 1 and 12 mortalities, respectively. The estimated fishery-related mortality to pilot whales in the U.S. Atlantic attributable to this fishery in 1994 was 2.0 (CV=0.49) and 22 (CV=0.33) in 1995. ~~Since this fishery no longer exists, it has been excluded from Table 2.~~

Two interactions with pilot whales in the Atlantic tuna purse seine fishery were observed in 1996. In one interaction, the net was actually pursed around one pilot whale, the rings were released and the animal escaped alive, condition unknown. This set occurred east of the Great South Channel and just north of the Cultivator Shoals region on Georges Bank. In a second interaction, 5 pilot whales were encircled in a set. The net was opened prior to pursing to let the whales swim free, apparently uninjured. This set occurred on the Cultivator Shoals region on Georges Bank. No trips were observed during 1997 through 1999. Four trips were observed in September 2001. No marine mammals were observed taken during these trips.

~~**Mid-Atlantic Coastal Gillnet**~~

~~No pilot whales were taken in observed trips during 1993-1997. One pilot whale was observed taken in 1998, 0 during 1999-2004. Using the observed takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 7 in 1998 (1.10).~~

~~**Atlantic Squid, Mackerel, Butterfish Trawl Fisheries**~~

~~*Illex* Squid~~

~~Since 1996, 45% of all pilot whale takes observed were caught incidental to *Illex* squid fishing operations; 1 in 1996, 1 in 1998 and 2 in 2000. Annual observer coverage of this fishery has varied widely and reflects only the months when the fishery is active. The estimated fishery-related mortality of pilot whales attributable to this fishery was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 0 in 1999, 34 in 2000 (CV=0.65), unknown in 2001-2002 due to no observer coverage, and 0 in 2003. The average annual mortality between 1999-2003 was 11 pilot whales (CV=0.65).~~

~~*Loligo* Squid~~

~~Only one pilot whale incidental take has been observed in *Loligo* squid fishing operations since 1996. The one take was observed in 1999 in the offshore fishery. No pilot whale takes have been observed in the inshore fishery. The estimated fishery-related mortality of pilot whales attributable to the fall/winter offshore fishery was 0 between 1996 and 1998, 49 in 1999 (CV=0.97) and 0 between 2000 and 2003. The average annual mortality between 1999-2003 was 10 pilot whales (CV=0.97). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.~~

~~Atlantic Mackerel~~

~~No incidental takes of pilot whales have been observed in the domestic mackerel fishery.~~

~~A U.S. joint venture (JV) fishery was conducted in the mid-Atlantic region from February to May 1998. NMFS maintained 100% observer coverage of the foreign joint venture vessels where 152 transfers from the U.S. vessels were observed. No incidental takes of pilot whales have been observed in the mackerel fishery. The former distant water fleet fishery has been non-existent since 1977. There is also a mackerel trawl fishery in the Gulf of Maine that generally occurs during the summer and fall months (May-December) (Clark ed. 1998). There have been no observed incidental takes of pilot whales reported for the Gulf of Maine fishery.~~

~~**Mid-Atlantic Mixed Species Trawl Fisheries**~~

~~There was one observed take in this fishery reported in 1999. The estimated fishery-related mortality for pilot whales attributable to this fishery was: 0 in 1996-1998, 228 in 1999 and 0 in 2000-2003. The average annual mortality between 1999-2003 was 46 pilot whales (CV=1.03). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage. (need Marjorie text).~~

Pelagic Longline

~~Total effort, excluding the Gulf of Mexico, for the pelagic longline fishery, based on mandatory self-reported fisheries information, from 1991 to 2000 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a; Yeung *et al.* 2000). In the 2001 Stock Assessment Report, the annual effort has been recalculated to include those sets targeting other species in conjunction with tuna/swordfish, instead of just effort that exclusively targeted~~

~~tuna/swordfish as in previous reports (Johnson *et al.* 1999; Yeung 1999a) *et al.* The fishery has been observed from January to March off Cape Hatteras, in May and June in the entire mid-Atlantic, and in July through December in the mid-Atlantic Bight and off Nova Scotia.~~ Most of the estimated marine mammal bycatch ~~was~~ is from U.S. Atlantic EEZ waters between South Carolina and Cape Cod (Johnson *et al.* 1999; Garrison 2003). Pilot whales are frequently observed to feed on hooked fish, particularly big-eye tuna (NMFS unpublished data). Between 1992 ~~and~~ and 2004 68 ~~2000, 62~~ pilot whales (including 2 identified as ~~a~~ short-finned pilot whales) were released alive, including 38 ~~32~~ that were considered seriously injured (of which 1 was identified as a short-finned pilot whale), and 3 ~~2~~ mortalities were observed. January-March bycatch was concentrated on the continental shelf edge northeast of Cape Hatteras. Bycatch was recorded in this area during April-June, and takes also occurred north of Hydrographer Canyon off the continental shelf in water over 1,000 fathoms during April-June. During the July-September period, takes occurred on the continental shelf edge east of Cape Charles, Virginia, and on Block Canyon slope in over 1,000 fathoms of water. October-December bycatch occurred between the 20 and 50 fathom isobaths ~~contour lines~~ between Barnegat Bay and Cape Hatteras. The estimated fishery-related mortality to pilot whales in the U.S. Atlantic (excluding the Gulf of Mexico) attributable to this fishery was: 127 in 1992 (CV=1.00), 0 from 1993-1998, 93 in 1999 (CV=1.00), 24 in 2000 (CV=1.0), 20 (CV = 1.0) in 2001, 2 (CV =1.0) in 2002, ~~and~~ 0 in 2003-2004. The estimated serious injuries were 40 (CV=0.71) in 1992, 19 (CV=1.00) in 1993, 232 (CV=0.53) in 1994, 345 (CV= 0.51) in 1995, (includes 37 estimated short-finned pilot whales in 1995 (CV=1.00), 0 from 1996 to 1998, 288 (CV=0.74) in 1999, 109 (CV=1.00) in 2000, 50 in 2001 (CV = 0.58), 51 in 2002 (CV = 0.48), ~~and~~ 21 in 2003 (CV = 0.~~49~~78), and 74 in 2004 (CV=0.42). The average 'combined' annual mortality in 2000-2004~~1 999-2003~~ was 70~~132~~ pilot whales (CV=0.37)~~(CV =0.49)~~ (Table 2).

~~**Atlantic Tuna Purse Seine**~~

~~Two interactions with pilot whales were observed in 1996. In one interaction, the net was actually pursed around one pilot whale, the rings were released and the animal escaped alive, condition unknown. This set occurred east of the Great South Channel and just north of the Cultivator Shoals region on Georges Bank. In a second interaction, 5 pilot whales were encircled in a set. The net was opened prior to pursing to let the whales swim free, apparently uninjured. This set occurred on the Cultivator Shoals region on Georges Bank. No trips were observed during 1997 through 1999. Four trips were observed in September 2001. No marine mammals were observed taken during these trips.~~

~~**Atlantic Squid, Mackerel, Butterfish Trawl Fisheries**~~

~~*Illex* Squid~~

~~Since 1996, 45% of all pilot whale takes observed were caught incidental to *Illex* squid fishing operations; 1 in 1996, 1 in 1998 and 2 in 2000. Annual observer coverage of this fishery has varied widely and reflects only the months when the fishery is active. The estimated fishery-related mortality of pilot whales attributable to this fishery was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 0 in 1999, 34 in 2000 (CV=0.65), unknown in 2001-2002 due to no observer coverage, and 0 in 2003 . The average annual mortality between 1999-2003 was 11 pilot whales (CV=0.65) (Table 2).~~

~~*Loligo* Squid~~

~~Only one pilot whale incidental take has been observed in *Loligo* squid fishing operations since 1996. The one take was observed in 1999 in the offshore fishery. No pilot whale takes have been observed in the inshore fishery. The estimated fishery-related mortality of pilot whales attributable to the fall/winter offshore fishery was 0 between 1996 and 1998, 49 in 1999 (CV=0.97) and 0 between 2000 and 2003 . The average annual mortality between 1999-2003 was 10 pilot whales (CV=0.97) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.~~

~~Atlantic Mackerel~~

~~No incidental takes of pilot whales have been observed in the domestic mackerel fishery.~~

~~A U.S. joint venture (JV) fishery was conducted in the mid-Atlantic region from February to May 1998. NMFS maintained 100% observer coverage of the foreign joint venture vessels where 152 transfers from the U.S. vessels were observed. No incidental takes of pilot whales have been observed in the mackerel fishery. The former distant water fleet fishery has been non-existent since 1977. There is also a mackerel trawl fishery in the Gulf of Maine that generally occurs during the summer and fall months (May-December) (Clark ed. 1998). There have been no observed incidental takes of pilot whales reported for the Gulf of Maine fishery.~~

~~**Mid-Atlantic Mixed Species Trawl Fisheries**~~

~~There was one observed take in this fishery reported in 1999. The estimated fishery-related mortality for pilot whales attributable to this fishery was: 0 in 1996-1998, 228 in 1999 and 0 in 2000-2003. The average annual mortality between 19991999-2003 was 46 pilot whales (CV=1.03) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.~~

Mid-Atlantic Bottom Trawl

~~Need Rossman text….~~

Two pilot whales were taken in the Gulf of Maine in 2000. Preliminary estimates of mortality attributed to the Northeast bottom and Mid-Atlantic fisheries have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

~~Estimated annual fishery-related mortalities (CV in parentheses) were: 17 (0.30) in 2000, 12 (0.35) in 2001, 11 (0.32) in 2002, 10 (0.37) in 2003, and 12 (0.37) in 2004 (Table 2; Rossman in prep.). The average annual estimated fishery-related mortality during 2002-2004 was 12 (0.15).~~

~~**Northeast Atlantic (Gulf of Maine/Georges Bank) Herring Fishery**~~

GOM/GB Herring Mid-Water Trawl JV and TALFF

There were no marine mammal takes observed from the domestic mid-water trawl fishing trips between 2000-2004.~~during .~~

A U.S. joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August ~~-~~to December 2001. Eight pilot whales were incidentally captured in a single mid-water trawl during JV fishing operations. Three pilot whales were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF) (Table 2). The 2000-2004 ~~1999-2003~~ average mortality attributed to the Atlantic herring mid-water trawl fishery was 11~~2~~ animals (Table 2).

Northeast Bottom Trawl

The fishery is active in New England waters in all seasons. Two pilot whales were taken in the Gulf of Maine in 2004. ~~(Need MR text- see next fishery)~~ Preliminary estimates of mortality attributed to the Northeast bottom and Mid-Atlantic fisheries have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006. ~~Estimated annual fishery-related mortalities (CV in parentheses) were: 13 (0.33) in 2000, 14 (0.36) in 2001, 12 (0.36) in 2002, 13 (0.35) in 2003, and 11 (0.36) in 2004 (Table 2; Rossman in prep.). The average annual estimated fishery-related mortality during 2000-2004 was 13 (CV=0.16).~~

Northeast Mid-Water Trawl – Including Pair Trawl

The two most commonly targeted fish in this fishery are herring (94% of VTR records) and mackerel (0.4%). Thus, the observer coverage and bycatch estimates are only for these two sub-fisheries. The observer coverage in this fishery was highest during 2003 and 2004, though a few trips in earlier years were observed (Table 2). A pilot whale was observed taken in the single trawl fishery on the northern edge of Georges Bank (off of Massachusetts) in a haul that was targeting (and primarily caught) herring. Due to small sample sizes, the bycatch rate model used all observed mid-water trawl data, including paired and single, and Northeast and Mid-Atlantic mid-water trawls, that targeted either herring or mackerel and were observed between 1999 and 2004 (Palka, in prep). The model that best fit these data was a binomial logistic regression model that included target species and bottom slope as significant explanatory variables, and soak duration as the unit of effort. Estimated annual fishery-related mortalities (CV in parentheses) were: 4.6 (0.74) in 2000, 11 (0.74) in 2001, 8.9 (0.74) in 2002, 14 (0.74) in 2003, and 5.8 (0.74) in 2004 (Table 2; Palka in prep.). The average annual estimated fishery-related mortality during 2002-2004 was 8.9 (0.35).

~~**Mid-Atlantic Coastal Gillnet**~~

~~No pilot whales were taken in observed trips during 1993-1997. One pilot whale was observed taken in 1998, 0 during 1999-2003 (Table 2). Observed effort was scattered between New York and North Carolina from 1 to 50 miles off the beach. All bycatches were documented during January to April. Using the observed takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 7 in 1998 (1.10). Average annual~~

~~estimated fishery-related mortality attributable to this fishery between 1999-2003 was zero pilot whale.~~

CANADA

An unknown number of pilot whales have also been taken in Newfoundland, ~~and~~ Labrador, and Bay of Fundy groundfish gillnets; ~~,~~ Atlantic Canada and Greenland salmon gillnets; ~~,~~ and Atlantic Canada cod traps (Read 1994).

Between January 1993 and December 1994, 36 Spanish deep-water trawlers, covering 74 fishing trips (4,726 fishing days and 14,211 sets), were observed in NAFO Fishing Area 3 (off the Grand Banks) (Lens 1997). A total of 47 incidental catches were recorded, which included 1 long-finned pilot whale. The incidental mortality rate for pilot whales was 0.007/set.

In Canada, the fisheries observer program places observers on all foreign fishing vessels, on between 25% and 40% of large Canadian vessels (greater than 100ft), and on approximately 5% of small vessels (Hooker *et al.* 1997). Fishery observer effort off the coast of Nova Scotia during 1991-1996 varied on a seasonal and annual basis, reflecting changes in fishing effort (see Figure 3, Hooker *et al.* 1997). During the 1991-1996 period, long-finned pilot whales were bycaught (number of animals in parentheses) in bottom trawl (65); midwater trawl (6); and longline (1) gear. Recorded bycatches by year were: 16 in 1991, 21 in 1992, 14 in 1993, 3 in 1994, 9 in 1995 and 6 in 1996. Pilot whale bycatches occurred in all months except January-March and September (Hooker *et al.* 1997).

~~Table 2. Summary of the incidental mortality and serious injury of pilot whales (*Globicephala sp.*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).~~

Table 2. Summary of the incidental mortality and serious injury of pilot whales (*Globicephala sp.*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels[a]	Data Type[b]	Observer Coverage[c]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality[d]	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
Mid-Atlantic Bottom Trawl[e]	00-04	tbd	Obs. Data Dealer	.01, .01, .01, .01, .03	0, 0, 0, 0, 0	2, 0, 0, 0, 0	tbd	tbd	tbd	. tbd	tbd
Northeast Bottom Trawl[e]	00-04	tbd	Obs. Data Dealer Data VTR Data	.01, .01, .03, .04, .05	0, 0, 0, 0, 0	0, 0, 0, 0, 2	tbd	tbd	tbd	tbd	tbd
GOM/GB Herring Mid-Water Trawl JV and TALFF[f]	2001	10[g]	Obs. Data	1[h]	0	11	0	11	11	NA	11 (NA)
Northeast Mid-Water Trawl - Including Pair Trawl (Herring and Mackerel only)[e]	00-04	TBD	Obs. Data Dealer Data VTR Data	.005, .001, 0, .03, .14	0, 0, 0, 0, 0	0, 0, 0, 0, 1	0, 0, 0, 0, 0	4.6, 11, 8.9, 14, 5.8	4.6, 11, 8.9, 14, 5.8	.74, .74, .74, .74, .74	8.9 (.35)

Pelagic Longline (excluding NED-E)[i, j]	00-04	116, 98, 87, 63, 58	Obs. Data Logbook	.04, .04, .05, .09, .09	4, 4, 4, 2, 6	1, 1, 0, 0, 0	109, 50, 52, 21, 74	24, 20, 2, 0, 0	133, 70, 54, 21, 74	.88, .50, .46, .77, .42	70 (.37)
Pelagic Longline - NED-E area only[j]	01-03	9, 14, 11	Obs. Data Logbook	1, 1, 1	0, 0, 0	0, 0, 0	0, 0, 0	0, 0, 0	0, 0, 0	0, 0, 0	0
TOTAL											tbd

[a] Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.

[b] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).

[c] Observer coverage of the Mid-Atlantic coastal gillnet fishery is measured in tons of fish landed. Observer coverage for the longline fishery is in terms of sets. The trawl fisheries are measured in trips.

[d] Preliminary estimates of mortality attributed to the Northeast bottom and Mid-Atlantic fisheries have been generated for the years 2000-2004 but scientific review of the analysis is not complete. Therefore, mortality estimates are not reported in the bycatch table. Scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

[e] A new method was used to develop preliminary estimates of mortality for the Mid-Atlantic and Northeast bottom trawl fisheries during 2000-2004. They are a product of bycatch rates predicted by covariates in a model framework and effort reported by commercial fishermen on mandatory vessel logbooks. This method differs from the previous method used to estimate mortality in these fisheries prior to 2000. Therefore, the estimates reported prior to 2000 can not be compared to estimates during 2000-2004. In addition, the fisheries listed in Table 2 reflect new definitions defined by the proposed List of Fisheries for 2005 (FR Vol. 69, No. 231, 2004). The 'North Atlantic bottom trawl' fishery is now referred to as the 'Northeast bottom trawl. The Illex, Loligo and Mackerel fisheries are now part of the 'Mid-Atlantic bottom trawl fishery.

[f] NA=No joint venture or TALFF fishing effort for Atlantic herring.

[g] Three foreign vessels and seven American vessels.

[h] During joint venture fishing operations, nets that are transferred from the domestic vessel to the foreign vessels for processing are observed on board the foreign vessel. There may be nets fished by domestic vessels that do not get transferred to a foreign vessel for processing and therefore would not be observed. During TALFF fishing operations all nets fished by the foreign vessel are observed.

[i] 1999-2000 mortality estimates were taken from Table 10 in Yeung 2001 (NOAA Technical Memorandum NMFS-SEFSC-467).

[j] An experimental program to test effects of gear characteristics, environmental factors, and fishing practices on marine turtle bycatch rates in the Northeast Distant (NED-E) water component of the fishery was conducted from June 1, 2001-December 31, 2003. Observer coverage was 100% during this experimental fishery. Summaries are provided for the pelagic longline EXCLUDING the NED-E area in one row and for ONLY the NED in the second row. No mortalities or serious injuries were observed for pilot whales in the NED-E, though 1 pilot whale was caught alive and released without injury (Garrison, 2003; Garrison and Richards, 2004).

~~Fishery~~	~~Years~~	~~Vessels~~[4]	~~Data Type~~[1]	~~Observer Coverage~~[2]	~~Observed Serious Injury~~	~~Observed Mortality~~	~~Estimated Serious Injury~~	~~Estimated Mortality~~	~~Estimated Combined Mortality~~	~~Estimated CVs~~	~~Mean Annual Mortality~~
~~Mid-Atlantic Bottom Trawl~~[8]	~~00-04~~	~~TBD~~	~~Obs. Data Dealer~~	~~.004, .005, .005, .009, .025~~	~~0, 0, 0, 0, 0~~	~~2, 0, 0, 0~~	~~2, 0, 0, 0, 0~~	~~17, 12, 11, 10, 12~~	~~17, 12, 11, 10, 12~~	~~0.30, 0.35, 0.32, 0.37, 0.37~~	~~12 (0.15)~~
~~Northeast Bottom Trawl~~[8]	~~00-04~~	~~TBD~~	~~Obs. Data Dealer Data VTR Data~~	~~.004, .004, .021, .028, .045~~	~~0, 0, 0, 0, 0~~	~~0, 0, 0, 0, 2~~	~~0,0, 0, 0, 0~~	~~13, 14, 12, 13, 11~~	~~13, 14, 12, 13, 11~~	~~0.33, 0.36, 0.36, 0.35, 0.36~~	~~13 (0.16)~~
~~GOM/GB Herring Mid-Water Trawl-JV and TALFF~~[6]	~~00-04~~	~~2000=0 2001=10~~[5] ~~02-04=0~~	~~Obs. Data~~	~~NA 1.00~~[4] ~~, NA, NA, NA~~	~~0, 0, 0, 0, 0~~	~~0, 11, 0, 0, 0~~	~~0, 0, 0, 0, 0~~	~~0, 11, 0, 0, 0~~	~~0, 11, 0, 0, 0~~	~~NA~~	~~11 (NA)~~

~~Northeast Mid-Water Trawl - Including Pair Trawl (Herring and Mackerel only)~~ [7]	~~00-04~~	~~TBD~~	~~Obs. Data Dealer Data VTR Data~~	~~.004, .001, .000, .003, .143~~	~~0, 0, 0, 0, 0~~	~~0, 0, 0, 0, 1~~	~~0, 0, 0, 0, 0~~	~~4.6, 11, 8.9, 14, 5.8~~	~~4.6, 11, 8.9, 14, 5.8~~	~~0.74, 0.74,0.74, 0.74 , 0.74~~	~~8.9 (0.35)~~
~~Pelagic~~ [3] ~~Longline (excluding NED-E)~~ [10]	~~00-04~~	~~116, 98, 87, 63, 58~~	~~Obs. Data Logbook~~	~~.04, .04, .05, .09, .09~~	~~4, 4, 4, 2, 6~~	~~1, 1, 0, 0, 0~~	~~109, 50, 52, 21, 74~~	~~24, 20, 2, 0, 0~~	~~133, 70, 54, 21, 74~~	~~.88, .50, .46, .77, .42~~	~~70 (0.37)~~
~~Pelagic Longline - NED-E area only~~ [3, 10]	~~01-03~~	~~9, 14, 11~~	~~Obs. Data Logbook~~	~~1, 1, 1~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0~~
~~TOTAL~~											~~115 (0.23)~~

Other Mortality

Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these events is unknown. Between 2 and 168 pilot whales have stranded annually, either individually or in groups, along the eastern U.S. seaboard since 1980 (NMFS 1993b, stranding databases maintained by NMFS NER, NEFSC and SEFSC). From 2000-2004, 42 short-finned pilot whales (*Globicephala macrorhynchus*), 120 long-finned pilot whales (*Globicephala melas*), and 4 pilot whales not specified to the species level (*Globicephala* sp.) have been reported stranded between Maine and Florida, including Puerto Rico and the Exclusive Economic Zone (EEZ) when recorded, (Table 3). This includes several mass strandings as follows: 11 long-finned pilot whales mass stranded in Nantucket, MA in 2000 and 57 in 2002 in Dennis, MA; and 28 short-finned pilot whales stranded in Content Passage, Monroe County, FL (ocean side) on April 18, 2003. Two juvenile animals that live stranded in Chatham, Massachusetts in 1999 were rehabilitated, satellite tagged and released (Nawojchik *et at*. 2003). Both animals were released off eastern Long Island, New York and tracked for four months in the Gulf of Maine. Four of 6 animals from one live stranding event in Massachusetts in 2000 were rehabilitated and released. However, certain studies have shown that frequently, animals that are returned to the water swim away and strand someplace else (Fehring and Wells 1976; Irvine *et al.* 1979; Odell *et al.* 1980).The fate of the animals is footnoted in Table 3, when recorded.

An Unusual Mortality Event (UME) occurred along the coast of Virginia from May to July 2004, when 66 small cetaceans stranded mostly along the outer (eastern) coast of Virginia's barrier islands. Species included: 52 bottlenose dolphins (stock undetermined to date), 4 harbor porpoise (*Phocoena phocoena*), 4 common dolphins (*Delphinus delphis*), 4 Atlantic white-sided dolphins (*Lagenorhynchus acutus*), 1 Risso's dolphin (*Grampus griseus*), and 1 pilot whale (*Globicephala* sp.). Additional strandings occurring from August through December were found to be at similar rates to previous years, and were not included in this UME. Human interactions were implicated in 17 of the strandings (1 common and 16 bottlenose dolphins), other causes were implicated in 14 strandings (1 Atlantic white-sided dolphin, 2 harbor porpoises and 11 bottlenose dolphins), and the no cause could be determined for the remaining strandings, including the pilot whale. Five bottlenose dolphins and 1 common dolphin were entangled in pound nets when they stranded, 1 bottlenose dolphins was entangled in pot gear, and 3 bottlenose dolphins were entangled in unidentified netting or lines, and 2 bottlenose dolphins were found with cinder blocks tied to their flukes (one on Cedar Island in June, and one on the Chincoteague National Wildlife refuge in July), and a third had a frayed line tied to its flukes and was found in Wallops Island in July 2004. A final report on this UME is pending.

Another UME was declared when 36 small cetaceans stranded from Maryland to Georgia between 3 July and 2 December 2004. The species involved, which are generally found offshore and are not expected to strand along the coast, include: 15 pygmy sperm whales (*Kogia breviceps*), 1 dwarf sperm whale (*Kogia sima*), 8 offshore bottlenose dolphins (*Tursiops truncatus*), 3 short-beaked common dolphins (*Delphinus delphis*), 3 Risso's dolphins (*Grampus griseus*), 1 Clymene dolphin (*Stenella clymene*), 1 pantropical spotted dolphin (*Stenella attenuata*), 1 short-finned pilot whale (*Globicephala macrorhynchus*), 1 unidentified pilot whale (*Globicephala* sp.), 1 Sowerby's beaked whale (*Mesoplodon bidens*), and 1 unidentified small cetacean that was pushed off the beach alive. Preliminary necropsy results indicate that several bottlenose dolphins and the Clymene dolphin that stranded in NC exhibited inflammation in the spinal chord and brain, though necropsy analyses are still underway and no final determination on this UME has been made.

Short-finned pilot whales strandings (*Globicephala macrorhynchus*) have been reported stranded as far north as Nova Scotia (1990) and Block Island, Rhode Island (2001), though the majority of the strandings occurred from North Carolina southward (Table 3). Long-finned pilot whales (*Globicephala melas*) have been reported stranded as far south as Florida, when 2 long-finned pilot whales were reported stranded in Florida in November 1998, though their flukes had been apparently cut off, so it is unclear where these animals actually may have died. One additional long-finned pilot whale stranded in South Carolina in 2003, though the confidence in the species identification was only moderate. Most of the remaining long-finned pilot whale strandings were from North Carolina northward (Table 3).

In eastern Canada, 37 strandings of long-finned pilot whales (173 individuals) were reported on Sable Island, Nova Scotia from 1970 to 1998 (Lucas and Hooker 1997; Lucas and Hooker 2000). This included 130 animals that mass stranded in December 1976, and 2 smaller groups (<10 each) in autumn 1979 and summer 1992. Fourteen strandings were also recorded along Nova Scotia in 1991-1996 (Hooker et al. 1997). Several mass live strandings occurred in Nova Scotia recently - 14 pilot whales live mass stranded in 2000 and 3 in 2001 in Judique, Inverness County and 4 pilot whales live mass stranded at Point Tupper, Inverness County, in 2002, though no specification to species was made.

Table 3. Pilot whale (*Globicephala macrorhynchus* (SF), *Globicephala melas* (LF) *and Globicephala* sp. (Sp) strandings along the Atlantic coast, 2000-2004. Strandings which were not reported to species have been reported as *Globicephala* sp. The level of technical expertise among stranding network personnel varies, and given the potential difficulty in correctly identifying stranded pilot whales to species, reports to specific species should be viewed with caution.

STATE	**2000**			**2001**			**2002**			**2003**			**2004**			**TOTALS**		
	SF	**LF**	**Sp**	**SF**	**LF**	**Sp**	**SF**	**LF**	**Sp**	**SF**	**LF**	**Sp**	**SF**	**LF**	**Sp**	**SF**	**LF**	**Sp**
Nova Scotia[a]	0	0	16[a,b]	0	0	3[a,c]	0	0	7[a,d]	0	0	2[a]	0	0	3[a]	0	0	31[a]
Maine	0	0	0	1	5[e]	0	0	2	0	0	1	0	0	4	0	1	12	0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Massachusetts	0	11	2	0	3	0	0	65[f]	0	0	5	0	0	1	0	0	87	0
Rhode Island	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	1	3	0
Connecticut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New York	0	1	0	0	1	0	0	0	0	0	0	0	0	3	0	0	5	0
New Jersey	0	0	0	0	0	0	0	0	0	0	6[g]	0	0	0	0	0	6	0
Delaware	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maryland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1[h]	0	3	1
North Carolina	0	0	0	1	0	1[i]	0	0	0	2	0	1[i]	1[j]	1[j]	1[j]	4	1	3
South Carolina	0	0	0	1	0	0	0	0	0	0	1[k]	0	0	0	0	1	1[k]	0
Georgia	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Florida	0	0	0	0	0	0	0	0	0	29[l,m]	0	0	4	0	0	33	0	0

Puerto Rico	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
EEZ	0	1[n]	0	0	0	0	0	0	0	0	1[o]	0	0	0	0	0	2	0
TOTALS - U.S., Puerto Rico, & EEZ	1	15	0	5	9	1	0	68	0	31	18	1	5	10	2	42	120	4

a. Data supplied by Tonya Wimmer, Nova Scotia Marine Animal Response Society (pers. comm.). All Nova Scotia pilot whale strandings reported as pilot whales, so included as *Globicephala* sp.

b. Includes 14 mass live strandings at Judique, Inverness County on August 6, 2000 - 11 returned to sea. Reported as pilot whales, so included as *Globicephala* sp.

c. Three mass live stranded animals at Judique, Inverness County on July 19, 2001 - all returned to sea. Reported as pilot whales, so included as *Globicephala* sp.

d. Includes 4 mass live strandings at Point Tupper, Inverness County on January 11, 2002 - fate unreported. Reported as pilot whales, so included as *Globicephala* sp.

e. Includes one long finned pilot whale stranded with possible propeller marks in Maine in September 2001.

f. Includes mass stranding of 57 long-finned pilot whales in Dennis, MA in July 2002 – majority of pod refloated and released, but rebeached 1-2 days later ; ~30 animals euthanized, and ~11 animals died during the strandings.

g. Two long-finned pilot whales stranded dead separately in April 2003 off New Jersey with rope tied around the flukes.

h. One pilot whale stranded in Virginia in 2004 during an Unusual Mortality Event but was not identified to species(decomposed and decapitated), so included as *Globicephala* sp.

i. Reported as pilot whale, so included as *Globicephala* sp.

j. One short-finned pilot whale (September '04) and one pilot whale (November '04) not identified to species stranded in North Carolina during an Unusual Mortality Event (UME). A long-finned pilot whale also stranded in North Carolina in February, not related to any UME.

k. Only moderate confidence on species identification as long-finned pilot whale.

l. Includes mass live stranding of 28 short-finned pilot whales in Content Passage, Monroe County, FL (Ocean side) on April 19, 2003 - 12 animals died or were euthanized at the scene, 9 were returned to sea, 7 were taken into rehabilitation of which 2 subsequently died and 5 were released to sea on August 10, 2003.

m. Signs of human interaction reported on 1 stranded short-finned pilot whale (not part of the live mass stranding), which stranded in May 2003 in Florida.

n. One long-finned pilot whale floating dead in Great South Channel offshore.

o. One long-finned pilot whale floating dead on Georges Bank offshore.

Between 2000-2004, human and/or fishery interactions were documented as follows: one long-finned pilot whale stranded with possible propeller marks in Maine in September 2001, two long-finned pilot whales stranded dead separately in April 2003 off New Jersey with rope tied around the flukes, and signs of human interaction were reported (but no specifics recorded in database) on 1 stranded short-finned pilot whale (not part of the live mass stranding), which stranded in May 2003 in Florida.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.), moderate levels of which have been found in pilot whale blubber (Taruski *et al.*1975; Muir *et al.* 1988; Weisbrod *et al.* 2000). Weisbrod *et al.* (2000) reported that bioaccumulation levels were more similar in whales from the same stranding group than animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Island drive fishery (Nielsen *et al.* 2000). Similarly, Dam and Bloch (2000) found very high PCB levels in pilot whales in the Faroes. The population effect of the observed levels of such contaminants is unknown. ~~**Other Mortality**~~

~~Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these~~

events is unknown. Between 2 and 120 pilot whales have stranded annually, either individually or in groups, in NMFS Northeast Region (Anon.Anonymous 1993b) since 1980. From 1999-2003 to, 126 pilot whales (*Globicephala sp.*) have been reported stranded between Maine and Florida (Table 3), including 11 and 57 animals that mass stranded in 2000 and 2002, respectively along the Massachusetts coast (NMFS unpublished data). Two juvenile animals that live stranded in Chatham, Massachusetts in 1999 were rehabilitated, satellite tagged and released (Noawojchik *et at*. 2003). Both animals were released off eastern Long Island, NewYork and tracked for four months in the Gulf of Maine. Four of 6 animals from one live stranding event in Massachusetts in 2000 were rehabilitated and released. In addition, 11 pilot whales that live stranded on Nantucket were returned to the water. However, certain studies have shown that frequently, animals that are returned to the water swim away and strand someplace else (Fehring and Wells 1976; Irvine *et al.* 1979; Odell *et al.* 1980).

Short-finned pilot whales (*Globicephala macrorhynchus*) have been reported stranded as far north as Block Island, Rhode Island (2001) and long-finned pilot whales (*Globicephala melas*) as far south as South Carolina. Rarely is there a distinction made between these two species within the U.S. east coast regional stranding records.

In eastern Canada, 37 strandings of long-finned pilot whales (173 individuals) were reported on Sable Island, Nova Scotia from 1970 to 1998 (Lucas and Hooker 1997; Lucas and Hooker 2000). This included 130 animals that mass stranded in December 1976, and 2 smaller groups (<10 each) in autumn 1979 and summer 1992. Fourteen strandings were also recorded along Nova Scotia in 1991-1996 (Hooker *et al.* 1997).

Table 3. Pilot Whale (*Globicephala sp.*) strandings along the U.S. Atlantic coast 1999-20032000 to 20044. No distinction has been made between short-finned (*Globicephala macrorhynchus*) and long-finned pilot whale (*G. melas*).

State	2000	2001	2002	2003	2004	TOTALS
Maine	0	5	2	1	4	8
New Hampshire	0	0	0	0	0	0
Massachusetts[1]	13	3	67	5	1	94
Rhode Island	0	1	1	0	1	2
Connecticut	0	0	0	0	0	0
New York	1	1	0	0	3	3
New Jersey	0	0	0	6	0	7
Delaware	0	0	0	0	0	0
Maryland	0	0	0	0	0	1
Virginia	0	0	0	0	0	2
North Carolina	0	2	0	0	2	4
South Carolina	0	1	0	1[2]	0	2
Georgia	1	0	0	0	0	1
Florida	0	0	0	0	4	2
TOTALS - U.S.	15	13	70	13	15	126
Nova Scotia	3	1	4	2	3	13

[1] Massachusetts mass stranding (11 animals, July 2000; 57 animals, July 2002)
[2] Only moderate confidence on species identification

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.), moderate levels of which have been found in pilot whale blubber (Taruski *et al.* 1975; Muir *et al.* 1988; Weisbrod *et al.* 2000). Weisbrod *et al.* (2000) reported that bioaccumulation levels were more similar in whales from the same standing group than animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Islands drive fishery (Nielsen *et al.* 2000). Similarly, Dam and Bloch (2000) found very high PCB levels in pilot whales in the Faroes. The population effect of the observed levels of such contaminants is unknown.

STATUS OF STOCK

The status of long-finned pilot whales relative to OSP in U.S. Atlantic EEZ is unknown, but stock abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel and squid stocks. There are insufficient data to determine the population trends for this species. The species is not listed under the Endangered Species Act. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. ~~This is not a strategic stock because the 1999-2003 2000-2004 estimated average annual fishery-related mortality, excluding Nova Scotia bycatches of pilot whales, *Globicephala* sp., does not exceed PBR. The status has gone back and forth, because mortality has been close to PBR. In the last six editions of this stock assessment report, it has been designated as non-strategic in 1998,, and 1999, 2005 and this year.~~ The status of this stock cannot be determined until the trawl bycatch mortality analysis is complete (Table 2).

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SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of pilot whales in the western North Atlantic - the Atlantic or long-finned pilot whale, *Globicephala melas,* and the short-finned pilot whale, *G. macrorhynchus*. These species are difficult to differentiate to the species level at sea; therefore, some of the descriptive material below refers to *Globicephala* sp. and is identified as such. The species boundary is considered to be in the New Jersey to Cape Hatteras area. Sightings north of this area are likely *G. melas*.

The short-finned pilot whale is distributed worldwide in tropical to warm temperate waters (Leatherwood and Reeves 1983). The northern extent of the range of this species within the U.S. Atlantic Exclusive Economic Zone (EEZ) is generally thought to be Cape Hatteras, North Carolina (Leatherwood and Reeves 1983). Sightings of these animals in the U.S. Atlantic EEZ occur in oceanic waters (Mullin and Fulling 2003) and along the continental shelf and continental slope in the northern Gulf of Mexico (Hansen *et al.* 1996; Mullin and Hoggard 2000; Mullin and Fulling 2003). There is no information on stock differentiation for the Atlantic population.

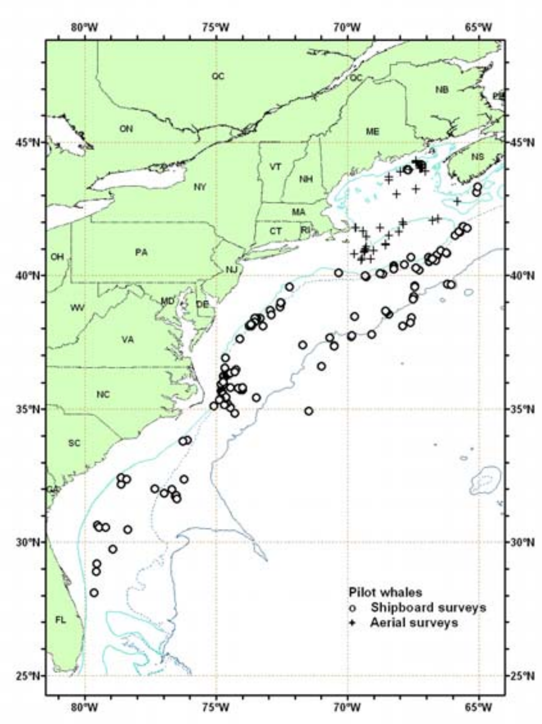

Figure 1. Distribution of pilot whale sightings from NEFSC and SEFSC vessel and aerial summer surveys during 1998 and 2004. Isobaths are at 100 m, ~~and~~ 1,000 m, and 4,000 m~~.~~

POPULATION SIZE

The total number of short-finned pilot whales off the eastern U.S. and Canadian Atlantic coast is unknown, although estimates from selected regions of the habitat do exist for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas (Figure~~.~~ 1). Two estimates were derived from catch data and population models that estimated the abundance of the entire stock. Seasonal estimates are available from selected regions in U.S. waters during spring, summer and autumn 1978-82, August 1990, June-July 1991, August-September 1991, June-July 1993, July-September 1995, July-August 1998, and June-August 2004. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* sp., both long-finned and short-finned pilot whales. One estimate is available from the Gulf of St. Lawrence.

Mitchell (1974) used cumulative catch data from the 1951-1961 drive fishery off Newfoundland to estimate the initial population size (ca. 50,000 animals).

Mercer (1975) used population models to estimate a population in the same region of between 43,000-96,000 long-finned pilot whales, with a range of 50,000-60,000 being considered the best estimate.

~~***Figure 1.** Distribution of pilot whale sightings from NEFSC and SEFSC vessel and aerial summer surveys during 1998 and 2004. Isobaths are at 100 and 1,000 m.*~~

An abundance of 11,120 (CV=0.29) *Globicephala* sp. was estimated from an aerial survey program conducted from 1978 to 1982 ~~on the~~ in continental shelf and shelf edge waters between Cape Hatteras, North Carolina, and Nova Scotia (CETAP 1982). An abundance of 3,636 (CV=0.36) *Globicephala* sp. was estimated from a June and July 1991 shipboard line-transect sighting survey conducted primarily between the 200 and 2,000 m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998).

A~~n a~~bundances of 3,368 (CV=0.28) and 5,377 (CV=0.53) *Globicephala* sp. w~~as~~ere estimated from line-transect aerial surveys conducted from August to September 1991 using ~~the~~ a Twin Otter and AT-11 aircrafts, respectively (~~Anon.~~ NMFS 1991). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than ~~eight~~ 8 years are deemed unreliable, and therefore should not be used for PBR determinations. Further, due to changes in survey methodology, these data should not be used to make comparisons to more current estimates.

An abundance of 668 (CV=0.55) *Globicephala* sp. was estimated from a June and July 1993 shipboard line-transect survey conducted principally between the 200 m and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Table 1; ~~Anon.~~ NMFS 1993a). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al*., ~~2001~~1993; Laake *et al*., 1993~~; Thomas *et al.* 1998~~). Estimates include school-size bias, if applicable, but do not include corrections for *g(0)*, the probability of detecting a group on the track line, or for dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 8,176 (CV=0.65) *Globicephala* sp. was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al*., ~~Unpubl.~~Unpublished Ms.). Total track line length was 32,600 km. The ships covered waters between the 50 and 1,000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the ~~mid~~mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1,000 fathom ~~depth contour line~~isobath. Data collection and analysis methods used were described in Palka (1996).

Kingsley and Reeves (1998) obtained an abundance estimate of 1,600 long-finned pilot whales (CV=0.65) from a late August and early September aerial survey of cetaceans in the Gulf of St. Lawrence in 1995 and 1998 (Table 1). Based on an examination of long-finned pilot whale summer distribution patterns and information on stock structure, it was deemed appropriate to combine these estimates with NMFS 1995 summer survey data. The best 1995 abundance estimate for *Globicephala* sp. is~~,~~ 9,776 (CV=0.55), ~~was~~ the sum of the estimates from the U.S. and Canadian surveys, where the estimate from the U.S. survey was 8,176 (CV=0.65) and from the Canadian survey was~~,~~ 1,600 (CV=0.65).

An abundance of 9,800 (CV=0.34) *Globicephala* sp. was estimated from a line-transect survey conducted during July 6 to September 6, 1998, by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38ºN) (Figure~~.~~ 1; Table 1; Palka *et al.*~~,~~ ~~Unpub~~Unpublished~~l~~ ~~.~~Ms.~~).~~). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 5,109 (CV=0.41) *Globicephala* sp. was estimated from a shipboard line-transect survey conducted between 8 July and 17 August 1998 that surveyed 4,163 km of track line in waters south of Maryland (38ºN) (Figure. 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993),~~.~~ ~~This estimate is a recalculation of the same data reported in previous SARs. For more details see Mullin and Fulling (2003).~~
where school size bias and ship attraction were accounted for.

The best 1998 abundance estimate for *Globicephala* sp. is 14,909 (CV=0.26), the sum of the estimates from the two U.S. Atlantic surveys, where the estimate from the northern U.S. Atlantic is 9,800 (CV=0.34) and from the southern U.S. Atlantic is 5,109 (CV=0.41). This estimate is a recalculation of the same data reported in previous SARs. This joint estimate is considered best because these two surveys have the most complete coverage of the species' habitat.

An abundance of 15,728 (CV=0.34) for *Globicephala* sp. was estimated from a line transect sighting survey conducted during 12 June ~~12~~ to 4 August ~~4,~~ 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (38ºN) to the Bay of Fundy (45ºN) (Figure 1; Palka U~~u~~npubl~~bl~~ished~~.~~). Shipboard data were collected using the two independent team line transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and *g(0)*, the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for *g(0)* and biases due to school size and other potential covariates (Figure 1; Palka U~~u~~npublished).

A shipboard survey of the U.S. Atlantic outer continental shelf and continental slope (water depths ≥50 m) between Florida and Maryland (27.5 and 38 ºN latitude) was conducted during June-August~~,~~ 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the ~~mid~~mid-Atlantic. The survey included 5,659 km of trackline, resulting in ~~and there were~~ a total of 473 cetacean sightings. Sightings were most frequent in waters north of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias ~~(~~*g(0)*~~)~~ and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka 1995; Buckland *et al.*, 2001). The resulting abundance estimate for *Globicephala* sp. between Florida and Maryland was 15,411 (CV=0.43).

The best 2004 abundance estimate for *Globicephala* sp. is the sum of the estimates from the two 2004 U.S. Atlantic surveys ~~, 30,847~~ 31,139 (CV=~~0.27~~0.27), where the estimate from the northern U.S. Atlantic is~~15,436~~ 15,728 (CV=~~0.33~~ 0.34), and from the southern U.S. Atlantic is 15,411 (CV=0.43). This joint estimate is considered the best because together these two surveys have the most complete coverage of the species' habitat.

Table 1. Summary of abundance estimates for the western North Atlantic *Globicephala* sp. by m~~M~~onth, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	9,800	0.34
Jul-Aug 1998	Florida to Maryland	5,109	0.41
Jul-Sep 1998	Florida to Gulf of St. Lawrence (COMBINED)	14,909~~[1]~~	0.26
Jun-Aug 2004	Maryland to Bay of Fundy	15,728	0.34
Jun-Aug 2004	Florida to Maryland	15,411	0.43
Jun-Aug 2004	Florida to Bay of Fundy (COMBINED)	31,139	0.27

~~[1] This is the combined estimate for the two survey areas~~

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for *Globicephala* sp. is 31,139 (CV=0.27). The minimum population estimate for *Globicephala* sp. 24,866.

Current Population Trend

There are insufficient data to determine the population trends for *Globicephala* sp~~.~~.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include those from animals taken in the Newfoundland drive fishery: calving interval 3.3 years; lactation period about 21-22 months; gestation period 12 months; births mainly from June to November; length at birth is 177 cm; mean length at sexual maturity is 490 cm for males and 356 cm for females; age at sexual maturity is 12 years for males and 6 years for females; mean adult length is 557 cm for males and 448 cm for females; and maximum age was 40 for males and 50 for females (Sergeant 1962; Kasuya *et al.* 1988). Analysis of data recently collected from animals taken in the Faroe Islands drive fishery produced higher values for all parameters (Bloch *et al.* 1993; Desportes *et al.* 1993; Martin and Rothery 1993). These differences are likely related, at least in part, to larger sample sizes and newer analytical techniques.

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for *Globicephala* sp. Is 24,866~~–~~. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be ~~48~~0.5 ~~because the CV of the average mortality estimate is between <0.3 and 0.6 (Wade and Angliss 1997), and because~~ this stock is of unknown status. Stock status will be determined when trawl fishery bycatch estimates are complete. PBR for the western North Atlantic *Globicephala* sp. is 249.

ANNUAL HUMAN-CAUSED MORTALITY

Fishery Information

Detailed fishery information ~~are~~ is reported in Appendix III. Total fishery-related mortality and serious injury cannot be estimated separately for the two species of pilot whales in the U.S. Atlantic EEZ because of the uncertainty in species identification by fishery observers. The Atlantic Scientific Review Group advised adopting the risk-averse strategy of assuming that either species might have been subject to the observed fishery-related mortality and serious injury. Preliminary fishery mortality estimates have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.~~Total annual estimated average fishery-related mortality or serious injury of this stock to *Globicephala* sp. during 2000-2004 1999-2003 in the U.S. fisheries listed below was 115 201 pilot whales (CV= 0.230.40) (Table 2).~~

~~The distribution of long-finned pilot whale, a northern species, overlaps with that of the short-finned pilot whale, a predominantly southern species, between 35E30'N to 38E00'N (Leatherwood *et al.* 1976). Although long-finned pilot whales are most likely taken in the waters north of Delaware Bay, many of the pilot whale takes are not identified to species and bycatch does occur in the overlap area. In this summary, therefore, fishing interactions are considered for undifferentiated pilot whales (*Globicephala* sp.).~~

Earlier Interactions

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the U.S. A fishery observer program, which has collected fishery data and information on incidental bycatch of marine mammals, was established in 1977 with the implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA). Foreign fishing operations for squid ceased at the end of the 1986 fishing season and, for mackerel, at the end of the 1991 fishing season.

During 1977-1991, observers in this program recorded 436 pilot whale mortalities in foreign-fishing activities (Waring *et al.* 1990; Waring 1995). A total of 391 pilot whales (90%) was taken in the mackerel fishery, and 41 (9%) occurred during *Loligo* and *Illex* squid-fishing operations. This total includes 48 documented takes by U.S. vessels involved in joint-venture fishing operations in which U.S. captains transfer their catches to foreign processing vessels. Due to temporal fishing restrictions, the bycatch occurred during winter/spring (December to May) in continental shelf and continental shelf edge waters (Fairfield *et al.* 1993; Waring 1995); however, the majority of the takes occurred in late spring along the 100m isobath. Two animals were also caught in both the hake and tuna longline fisheries (Waring *et al.* 1990).

Between 1989 and 1998, 87 mortalities were observed in the large pelagic drift gillnet fishery. The annual fishery-related mortality (CV in parentheses) was 77 in 1989 (0.24), 132 in 1990 (0.24), 30 in 1991 (0.26), 33 in 1992 (0.16), 31 in 1993 (0.19), 20 in 1994 (0.06), 9.1 in 1995 (0), 11 in 1996 (0.17), no fishery in 1997 and 12 in 1998 (0).

Five pilot whale (*Globicephala* sp.) mortalities were reported in the self-reported fisheries information for the Atlantic tuna pair trawl in 1993. In 1994 and 1995 observers reported 1 and 12 mortalities, respectively. The estimated fishery-related mortality to pilot whales in the U.S. Atlantic attributable to this fishery in 1994 was 2.0 (CV=0.49) and 22 (CV=0.33) in 1995.

Two interactions with pilot whales in the Atlantic tuna purse seine fishery were observed in 1996. In one interaction, the net was actually pursed around one pilot whale, the rings were released and the animal escaped alive, condition unknown. This set occurred east of the Great South Channel and just north of the Cultivator Shoals region on Georges Bank. In a second interaction, 5 pilot whales were encircled in a set. The net was opened prior to pursing to let the whales swim free, apparently uninjured. This set occurred on the Cultivator Shoals region on Georges Bank. No trips were observed during 1997 through 1999. Four trips were observed in September 2001. No marine mammals were observed taken during these trips.

Pelagic Longline

Most of the estimated marine mammal bycatch is from U.S. Atlantic EEZ waters between South Carolina and Cape Cod (Johnson *et al.* 1999; Garrison 2003). Pilot whales are frequently observed to feed on hooked fish, particularly big-eye tuna (NMFS unpublished data). Between 1992 and 2004 68 pilot whales (including 2 identified as short-finned pilot whales) were released alive, including 38 that were considered seriously injured (of which 1 was identified as a short-finned pilot whale), and 3 mortalities were observed. January-March bycatch was concentrated on the continental shelf edge northeast of Cape Hatteras. Bycatch was recorded in this area during April-June, and takes also occurred north of Hydrographer Canyon off the continental shelf in water over 1,000 fathoms during April-June. During the July-September period, takes occurred on the continental shelf edge east of Cape Charles, Virginia, and on Block Canyon slope in over 1,000 fathoms of water. October-December bycatch occurred between the 20 and 50 fathom isobaths between Barnegat Bay and Cape Hatteras. The estimated fishery-related mortality to pilot whales in the U.S. Atlantic (excluding the Gulf of Mexico) attributable to this fishery was: 127 in 1992 (CV=1.00), 0 from 1993-1998, 93 in 1999 (CV=1.00), 24 in 2000 (CV=1.0), 20 (CV = 1.0) in 2001, 2 (CV =1.0) in 2002, 0 in 2003-2004. The estimated serious injuries were 40 (CV=0.71) in 1992, 19 (CV=1.00) in 1993, 232 (CV=0.53) in 1994, 345 (CV= 0.51) in 1995, (includes 37 estimated short-finned pilot whales in 1995 (CV=1.00), 0 from 1996 to 1998, 288 (CV=0.74) in 1999, 109 (CV=1.00) in 2000, 50 in 2001 (CV = 0.58), 51 in 2002 (CV = 0.48), 21 in 2003 (CV = 0.78), and 74 in 2004 (CV=0.42). The average 'combined' annual mortality in 2000-2004-was 70 pilot whales (CV=0.37) (Table 2).

Mid-Atlantic Bottom Trawl

Two pilot whales were taken in the Gulf of Maine in 2000. Preliminary estimates of mortality attributed to the Northeast bottom and mid-Atlantic fisheries have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

GOM/GB Herring Mid-Water Trawl JV and TALFF

There were no marine mammal takes observed from the domestic mid-water trawl fishing trips between 2000-2004.

A U.S. joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August to December 2001. Eight pilot whales were incidentally captured in a single mid-water trawl during JV fishing operations. Three pilot whales were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF) (Table 2). The 2000-2004 average mortality attributed to the Atlantic herring mid-water trawl fishery was 11 animals (Table 2).

Northeast Bottom Trawl

The fishery is active in New England waters in all seasons. Two pilot whales were taken in the Gulf of Maine in 2004. Preliminary estimates of mortality attributed to the Northeast bottom and mid-Atlantic fisheries have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

Northeast Mid-Water Trawl – Including Pair Trawl

The two most commonly targeted fish in this fishery are herring (94% of VTR records) and mackerel (0.4%). Thus, the observer coverage and bycatch estimates are only for these two sub-fisheries. The observer coverage in this fishery was highest during 2003 and 2004, though a few trips in earlier years were observed (Table 2). A pilot whale was observed taken in the single trawl fishery on the northern edge of Georges Bank (off of Massachusetts) in a haul that was targeting (and primarily caught) herring. Due to small sample sizes, the bycatch rate model used all observed mid-water trawl data, including paired and single, and Northeast and mid-Atlantic mid-water trawls, that targeted either herring or mackerel and were observed between 1999 and 2004 (Palka, in prep). The model that best fit these data was a binomial logistic regression model that included target species and bottom slope as significant explanatory variables, and soak duration as the unit of effort. Estimated annual fishery-related mortalities (CV in parentheses) were: 4.6 (0.74) in 2000, 11 (0.74) in 2001, 8.9 (0.74) in 2002, 14 (0.74) in 2003, and 5.8 (0.74) in 2004 (Table 2; Palka in prep.). The average annual estimated fishery-related mortality during 2002-2004 was 8.9 (0.35).

CANADA

An unknown number of pilot whales have also been taken in Newfoundland and Labrador, and Bay of Fundy groundfish gillnets, Atlantic Canada and Greenland salmon gillnets, and Atlantic Canada cod traps (Read 1994).

Between January 1993 and December 1994, 36 Spanish deep-water trawlers, covering 74 fishing trips (4,726 fishing days and 14,211 sets), were observed in NAFO Fishing Area 3 (off the Grand Banks) (Lens 1997). A total of 47 incidental catches were recorded, which included 1 long-finned pilot whale. The incidental mortality rate for pilot whales was 0.007/set.

In Canada, the fisheries observer program places observers on all foreign fishing vessels, on between 25% and 40% of large Canadian vessels (greater than 100 ft), and on approximately 5% of small vessels (Hooker *et al.* 1997). Fishery observer effort off the coast of Nova Scotia during 1991-1996 varied on a seasonal and annual basis, reflecting changes in fishing effort (see Figure 3, Hooker *et al.* 1997). During the 1991-1996 period, long-finned pilot whales were bycaught (number of animals in parentheses) in bottom trawl (65); midwater trawl (6); and longline (1) gear. Recorded bycatches by year were: 16 in 1991, 21 in 1992, 14 in 1993, 3 in 1994, 9 in 1995 and 6 in 1996. Pilot whale bycatches occurred in all months except January-March and September (Hooker *et al.* 1997).

~~1~~

~~Table 2. Summary of the incidental mortality and serious injury of pilot whales (*Globicephala* sp.) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).~~

~~Fishery~~	~~Years~~	~~Vessels~~[4]	~~Data Type~~[1]	~~Observer Coverage~~[2]	~~Observed Serious Injury~~	~~Observed Mortality~~	~~Estimated Serious Injury~~	~~Estimated Mortality~~	~~Estimated Combined Mortality~~	~~Estimated CVs~~	~~Mean Annual Mortality~~
~~Mid-Atlantic Bottom Trawl~~[8]	~~00-04~~	~~TBD~~	~~Obs. Data Dealer~~	~~.004, .005, .005, .009, .025~~	~~0, 0, 0, 0, 0~~	~~2, 0, 0, 0, 0~~	~~2, 0, 0, 0, 0~~	~~17, 12, 11, 10, 12~~	~~17, 12, 11, 10, 12~~	~~.30, .35, .32, .37, .37~~	~~12 (.15)~~
~~Northeast Bottom Trawl~~[8]	~~00-04~~	~~TBD~~	~~Obs. Data Dealer Data VTR Data~~	~~.004, .004, .021, .028, .045~~	~~0, 0, 0, 0, 0~~	~~0, 0, 0, 0, 2~~	~~0, 0, 0, 0, 0~~	~~13, 14, 12, 13, 11~~	~~13, 14, 12, 13, 11~~	~~.33, .36, .36, .35, .36~~	~~13 (.16)~~

~~GOM/GB Herring Mid-Water Trawl JV and TALFF~~[6]	~~2001~~	~~10~~[5]	~~Obs. Data~~	~~1~~[7]	~~0~~	~~11~~	~~0~~	~~11~~	~~11~~	~~NA~~	~~11 (NA)~~
~~Northeast Mid-Water Trawl - Including Pair Trawl (Herring and Mackerel only)~~[8]	~~00-04~~	~~TBD~~	~~Obs. Data Dealer Data VTR Data~~	~~.004, .001, , .003, .143~~	~~0, 0, 0, 0, 0~~	~~0, 0, 0, 0, 1~~	~~0, 0, 0, 0, 0~~	~~4.6, 11, 8.9, 14, 5.8~~	~~4.6, 11, 8.9, 14, 5.8~~	~~.74, .74, .74, .74~~	~~8.9 (.35)~~
~~Pelagic Longline (excluding NED-E)~~[3, 9]	~~00-04~~	~~116, 98, 87, 63, 58~~	~~Obs. Data Logbook~~	~~.04, .04, .05, .09, .09~~	~~4, 4, 4, 2, 6~~	~~1, 1, 0, 0, 0~~	~~109, 50, 52, 21, 74~~	~~24, 20, 2, 0, 0~~	~~133, 70, 54, 21, 74~~	~~.88, .50, .46, .77, .42~~	~~70 (.37)~~
~~Pelagic Longline - NED-E area only~~[9]	~~01-03~~	~~9, 14, 11~~	~~Obs. Data Logbook~~	~~1, 1, 1~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0, 0, 0~~	~~0~~
~~TOTAL~~											~~115 (0.23)~~

~~1 Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).~~

~~2 Observer coverage of the mid-Atlantic coastal gillnet fishery is measured in tons of fish landed. Observer coverage for the longline fishery is in terms of sets. The trawl fisheries are measured in trips.~~

~~3 1999-2000 mortality estimates were taken from Table 10 in Yeung 2001 (NOAA Technical Memorandum NMFS-SEFSC-467).~~

~~4 Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.~~

~~5 Three foreign vessels and seven American vessels.~~

~~6 NA=No joint venture or TALFF fishing effort for Atlantic herring.~~

~~7 During joint venture fishing operations, nets that are transferred from the domestic vessel to the foreign vessels for processing are observed on board the foreign vessel. There may be nets fished by domestic vessels that do not get transferred to a foreign vessel for processing and therefore would not be observed. During TALFF fishing operations all nets fished by the foreign vessel are observed.~~

~~9 An experimental program to test effects of gear characteristics, environmental factors, and fishing practices on marine turtle bycatch rates in the Northeast Distant (NED-E) water component of the fishery was conducted from June 1, 2001-December 31, 2003. Observer coverage was 100% during this experimental fishery. Summaries are provided for the pelagic longline EXCLUDING the NED-E area in one row and for ONLY the NED in the second row. No mortalities nor serious injuries were observed for pilot whales in the NED-E, though 1 pilot whale was caught alive and released without injury (Garrison, 2003; Garrison and Richards, 2004).Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).~~

~~2 Observer coverage in the bottom trawl and mid-water trawl fisheries are measured in trips.~~

~~3 These are numbers of potential fishing vessels based on permit holders in the 2002 fishery. Many of these vessels participate in the other fisheries and therefore the reported number of vessels are not additive across the squid, mackerel and butterfish fisheries. (67FR65937).~~[4] ~~During Joint Venture (JV) fishing operations, nets that are transferred from the domestic vessel to the foreign vessels for processing are observed on board the foreign vessel. There may be nets fished by domestic vessels that do not get transferred to a foreign vessel for processing and therefore would not be observed. During TALFF fishing operations all nets fished by the foreign vessel are observed.~~

~~5 Three foreign vessels and seven American vessels.~~

~~6 NA=No joint venture or TALFF fishing effort for Atlantic herring.~~

~~7 The domestic fishery is prosecuted by the U.S. fleet only and is not subject to the 100% observer coverage that is mandated for fishing under a JV or TALFF herring quota.~~

~~[8] Preliminary estimates of mortality attributed to the Northeast bottom trawl fishery have been generated for the years 2000-2004. The estimates will not e reported until scientific review is complete. Complete review is anticipated prior to the commencement of the Atlantic trawl take reduction team in September 2006.~~

~~[9] Four year mean mortality estimate from 2000-2003 only.~~

Table 2. Summary of the incidental mortality and serious injury of pilot whales (*Globicephala sp.*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels[a]	Data Type[b]	Observer Coverage[c]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality[d]	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
Mid-Atlantic Bottom Trawl[e]	00-04	TBD	Obs. Data Dealer	.01, .01, .01, .01, .03	0, 0, 0, 0, 0	2, 0, 0, 0, 0	tbd	tbd	tbd	tbd	tbd
Northeast Bottom Trawl[e]	00-04	TBD	Obs. Data Dealer Data VTR Data	.01, .01, .03, .04, .05	0, 0, 0, 0, 0	0, 0, 0, 0, 2	tbd	tbd	tbd	tbd	tbd
GOM/GB Herring Mid-Water Trawl JV and TALFF[f]	2001	10[g]	Obs. Data	1[h]	0	11	0	11	11	NA	11 (NA)
Northeast Mid-Water Trawl - Including Pair Trawl (Herring and Mackerel only)[e]	00-04	TBD	Obs. Data Dealer Data VTR Data	.005, .001, 0, .03, .14	0, 0, 0, 0, 0	0, 0, 0, 0, 1	0, 0, 0, 0, 0	4.6, 11, 8.9, 14, 5.8	4.6, 11, 8.9, 14, 5.8	.74, .74, .74, .74, .74	8.9 (.35)
Pelagic Longline (excluding NED-E)[i, j]	00-04	116, 98, 87, 63, 58	Obs. Data Logbook	.04, .04, .05, .09, .09	4, 4, 4, 2, 6	1, 1, 0, 0, 0	109, 50, 52, 21, 74	24, 20, 2, 0, 0	133, 70, 54, 21, 74	.88, .50, .46, .77, .42	70 (.37)
Pelagic Longline - NED-E area only[j]	01-03	9, 14, 11	Obs. Data Logbook	1, 1, 1	0, 0, 0	0, 0, 0	0, 0, 0	0, 0, 0	0, 0, 0	0, 0, 0	0
TOTAL											tbd

[a] Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.

[b] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).

[c] Observer coverage of the mid-Atlantic coastal gillnet fishery is measured in tons of fish landed. Observer coverage for the longline fishery is in terms of sets. The trawl fisheries are measured in trips.

[d] Preliminary estimates of mortality attributed to the Northeast bottom and mid-Atlantic fisheries have been generated for the years 2000-2004 but scientific review of the analysis is not complete. Therefore, mortality estimates are not reported in the bycatch table. Scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

[e] A new method was used to develop preliminary estimates of mortality for the mid-Atlantic and Northeast bottom trawl fisheries during 2000-2004. They are a product of bycatch rates predicted by covariates in a model framework and effort reported by commercial fishermen on

mandatory vessel logbooks. This method differs from the previous method used to estimate mortality in these fisheries prior to 2000. Therefore, the estimates reported prior to 2000 can not be compared to estimates during 2000-2004. In addition, the fisheries listed in Table 2 reflect new definitions defined by the proposed List of Fisheries for 2005 (FR Vol. 69, No. 231, 2004). The 'North Atlantic bottom trawl' fishery is now referred to as the 'Northeast bottom trawl'. The Illex, Loligo and Mackerel fisheries are now part of the 'mid-Atlantic bottom trawl' fishery.

[f] NA=No joint venture or TALFF fishing effort for Atlantic herring.

[g] Three foreign vessels and seven American vessels.

[h] During joint venture fishing operations, nets that are transferred from the domestic vessel to the foreign vessels for processing are observed on board the foreign vessel. There may be nets fished by domestic vessels that do not get transferred to a foreign vessel for processing and therefore would not be observed. During TALFF fishing operations all nets fished by the foreign vessel are observed.

[i] 1999-2000 mortality estimates were taken from Table 10 in Yeung 2001 (NOAA Technical Memorandum NMFS-SEFSC-467).

[j] An experimental program to test effects of gear characteristics, environmental factors, and fishing practices on marine turtle bycatch rates in the Northeast Distant (NED-E) water component of the fishery was conducted from June 1, 2001-December 31, 2003. Observer coverage was 100% during this experimental fishery. Summaries are provided for the pelagic longline EXCLUDING the NED-E area in one row and for ONLY the NED in the second row. No mortalities or serious injuries were observed for pilot whales in the NED-E, though 1 pilot whale was caught alive and released without injury (Garrison, 2003; Garrison and Richards, 2004).

Other Mortality

Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these events is unknown. Between 2 and 168 pilot whales have stranded annually, either individually or in groups, along the eastern U.S. seaboard since 1980 (NMFS 1993b, stranding databases maintained by NMFS NER, NEFSC and SEFSC). From 2000-2004, 42 short-finned pilot whales (*Globicephala macrorhynchus*), 120 long-finned pilot whales (*Globicephala melas*), and 4 pilot whales not specified to the species level (*Globicephala* sp.) have been reported stranded between Maine and Florida, including Puerto Rico and the Exclusive Economic Zone (EEZ) when recorded, (Table 3). This includes ~~including~~ several mass strandings as follows: 11 ~~short~~long-finned pilot whales mass stranded in Nantucket, MA ~~whales~~ in 2000 and 57 in 2002 in Dennis, MA~~Massachusetts~~; and 28 short-finned pilot whales ~~that~~ stranded in Content Passage, Monroe County, FL (ocean side) on April 18, 2003.~~-~~ Two juvenile animals that live stranded in Chatham, Massachusetts in 1999 were rehabilitated, satellite tagged and released (Nawojchik *et at*. 2003). Both animals were released off eastern Long Island, New York and tracked for four months in the Gulf of Maine. Four of 6 animals from one live stranding event in Massachusetts in 2000 were rehabilitated and released. However, certain studies have shown that frequently, animals that are returned to the water swim away and strand someplace else (Fehring and Wells 1976; Irvine *et al.* 1979; Odell *et al.* 1980).The fate of the animals is footnoted~~specified~~ in Table 3, when recorded.

An Unusual Mortality Event (UME) occurred along the coast of Virginia from May to July 2004, when 66 small cetaceans stranded mostly along the outer (eastern) coast of Virginia's barrier islands. Species included: 52 bottlenose dolphins (stock undetermined to date), 4 harbor porpoise (*Phocoena phocoena*), 4 common dolphins (*Delphinus delphis*), 4 Atlantic white-sided dolphins (*Lagenorhynchus acutus*), 1 Risso's dolphin (*Grampus griseus*), and 1 pilot whale (*Globicephala* sp.). Additional strandings occurring from August through December were found to be at similar rates to previous years, and were not included in this UME. Human interactions were implicated in 17 of the strandings (1 common and 16 bottlenose dolphins), other causes were implicated in 14 strandings (1 Atlantic white-sided dolphin, 2 harbor porpoises and 11 bottlenose dolphins), and the no cause could be determined for the remaining strandings, including the pilot whale. Five bottlenose dolphins and 1 common dolphin were entangled in pound nets when they stranded, 1 bottlenose dolphins was entangled in pot gear, and 3 bottlenose dolphins were entangled in unidentified netting or lines, and 2 bottlenose dolphins were found with cinder blocks tied to their flukes (one on Cedar Island in June, and one on the Chincoteague National Wildlife refuge in July), and a third had a frayed line tied to its flukes and was found in Wallops Island in July 2004. A final report on this UME is pending.

Another UME was declared when 36 small cetaceans stranded from Maryland to Georgia between 3 July and 2 December 2004. The species involved, which are generally found offshore and are not expected to strand along the coast, include: 15 pygmy sperm whales (*Kogia breviceps*), 1 dwarf sperm whale (*Kogia sima*), 8 offshore bottlenose dolphins (*Tursiops truncatus*), 3 short-beaked common dolphins (*Delphinus delphis*), 3 Risso~~=~~'s dolphins (*Grampus griseus*), 1 Clymene dolphin (*Stenella clymene*), 1 pantropical spotted dolphin (*Stenella attenuata*), 1 short-finned pilot whale (*Globicephala macrorhynchus*), 1 unidentified pilot whale (*Globicephala* sp.), 1 Sowerby's beaked whale (*Mesoplodon bidens*), and 1 unidentified small cetacean that was pushed off the beach alive. Preliminary necropsy results indicate that several bottlenose dolphins and the Clymene dolphin that stranded in NC exhibited inflammation in the spinal chord and brain, though necropsy analyses are still underway and no final determination on this UME has been made.

Short-finned pilot whales strandings (*Globicephala macrorhynchus*) have been reported stranded as far north as Nova Scotia (1990) and Block Island, Rhode Island (2001), though the majority of the strandings occurred from North Carolina southward (Table 3). L~~ and l~~ong-finned pilot whales (*Globicephala melas*) have been reported stranded as far south as Florida, when 2 long-finned pilot whales were reported stranded in Florida in November 1998, though their flukes had been apparently cut off, so it is unclear where these animals actually may have died. One additional long-finned pilot whale stranded in South Carolina in 2003, though the confidence in the species identification was only moderate. Most of the remaining long-finned pilot whale strandings were from North Carolina northward (Table 3).~~South Carolina.~~

In eastern Canada, 37 strandings of long-finned pilot whales (173 individuals) were reported on Sable Island, Nova Scotia from 1970 to 1998 (Lucas and Hooker 1997; Lucas and Hooker 2000). This included 130 animals that mass stranded in December 1976, and 2 smaller groups (<10 each) in autumn 1979 and summer 1992. Fourteen strandings were also recorded along Nova Scotia in 1991-1996 (Hooker et al. 1997). Several mass live strandings occurred in Nova Scotia recently - 14 pilot whales live mass stranded in 2000 and 3 in 2001 in Judique, Inverness County and 4 pilot whales live mass stranded at Point Tupper, Inverness County,~~–~~ in 2002, though no specification to species was made.

Table 3. Pilot whale (*Globicephala macrorhynchus* (SF), *Globicephala melas* (LF) *and Globicephala* sp. (Sp) strandings along the Atlantic coast, 2000-2004. Strandings which were not reported to species have been reported as *Globicephala* sp. The level of technical expertise among stranding network personnel varies, and given the potential difficulty in correctly identifying stranded pilot whales to species, reports to specific species should be viewed with caution.

STATE	2000			2001			2002			2003			2004			TOTALS		
	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp
Nova Scotia[a]	0	0	16[~~1~~a, ~~2~~b]	0	0	3[~~1~~a, ~~3~~c]	0	0	7[~~1~~a, ~~4~~d]	0	0	2[~~1~~a]	0	0	3[~~1~~a]	0	0	31[~~1~~ a]
Maine	0	0	0	1	5[~~5~~e]	0	0	2	0	0	1	0	0	4	0	1	12	0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Massachusetts	0	11~~1~~ ~~3~~[~~6~~]	2~~0~~	0	3	0	0	65[~~7~~f]	0	0	5	0	0	1	0	0	87	0
Rhode Island	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	1	3	0
Connecticut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New York	0	1	0	0	1	0	0	0	0	0	0	0	0	3	0	0	5	0
New Jersey	0	0	0	0	0	0	0	0	0	0	6[~~8~~g]	0	0	0	0	0	6	0
Delaware	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maryland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1[~~9~~h]	0	3	1
North Carolina	0	0	0	1	0	1[~~10~~i]	0	0	0	2	0	1[~~10~~i]	1[~~11~~j]	1[~~11~~j]	1[~~11~~j]	4	1	3
South Carolina	0	0	0	1	0	0	0	0	0	0	1[~~12~~k]	0	0	0	0	1	1[12]	0
Georgia	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Florida	0	0	0	0	0	0	0	0	0	29[~~13~~l, ~~1~~ ~~4~~m]	0	0	4	0	0	33	0	0

Puerto Rico	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
EEZ	0	1~~15~~[n]	0	0	0	0	0	0	0	0	1~~16~~[o]	0	0	0	0	0	2	0
TOTALS - U.S., Puerto Rico, & EEZ	1	15	0	5	9	1	0	68	0	31	18	1	5	10	2	42	120	4

[a] Data supplied by Tonya Wimmer, Nova Scotia Marine Animal Response Society (pers. comm.). All Nova Scotia pilot whale strandings reported as pilot whales, so included as *Globicephala* sp.

[b] Includes 14 mass live strandings at Judique, Inverness County on August 6, 2000 - 11 returned to sea. Reported as pilot whales, so included as *Globicephala* sp.

[c] Three mass live stranded animals at Judique, Inverness County on July 19, 2001 - all returned to sea. Reported as pilot whales, so included as *Globicephala* sp.

[d] Includes 4 mass live strandings at Point Tupper, Inverness County on January 11, 2002 - fate unreported. Reported as pilot whales, so included as *Globicephala* sp.

[e] Includes one long finned pilot whale stranded with possible propeller marks in Maine in September 2001.

[f] Includes mass stranding of 57 long-finned pilot whales in Dennis, MA in July 2002 – majority of pod refloated and released, but rebeached 1-2 days later ; ~30 animals euthanized, and ~11 animals died during the strandings.

[g] Two long-finned pilot whales stranded dead separately in April 2003 off New Jersey with rope tied around the flukes.

[h] One pilot whale stranded in Virginia in 2004 during an Unusual Mortality Event but was not identified to species(decomposed and decapitated), so included as *Globicephala* sp.

[i] Reported as pilot whale, so included as *Globicephala* sp.

[j] One short-finned pilot whale (September '04) and one pilot whale (November '04) not identified to species stranded in North Carolina during an Unusual Mortality Event (UME). A long-finned pilot whale also stranded in North Carolina in February, not related to any UME.

[k] Only moderate confidence on species identification as long-finned pilot whale.

[l] Includes mass live stranding of 28 short-finned pilot whales in Content Passage, Monroe County, FL (Ocean side) on April 19, 2003 - 12 animals died or were euthanized at the scene, 9 were returned to sea, 7 were taken into rehabilitation of which 2 subsequently died and 5 were released to sea on August 10, 2003.

[m] Signs of human interaction reported on 1 stranded short-finned pilot whale (not part of the live mass stranding), which stranded in May 2003 in Florida.

[n] One long-finned pilot whale floating dead in Great South Channel offshore.

[o] One long-finned pilot whale floating dead on Georges Bank offshore.

Between 2000-2004, human and/or fishery interactions were documented as follows: one long-finned pilot whale stranded with possible propeller marks in Maine in September 2001, two long-finned pilot whales stranded dead separately in April 2003 off New Jersey with rope tied around the flukes, and signs of human interaction were reported (but no specifics recorded in database) on 1 stranded short-finned pilot whale (not part of the live mass stranding), which stranded in May 2003 in Florida.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.), moderate levels of which have been found in pilot whale blubber (Taruski~~-~~ *et al.* 1975; Muir *et al.* 1988; Weisbrod *et al.* 2000). Weisbrod *et al.* (2000) reported that bioaccumulation levels were more similar in whales from the same stranding group than animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Island drive fishery (Nielsen *et al.* 2000). Similarly, Dam and Bloch (2000) found very high PCB levels in pilot whales in the Faroes. The population effect of the observed levels of such contaminants is unknown.

~~Table 3. Pilot whales (*Globicephala macrohynchus*) strandings along the Atlantic coast, 1999-2003~~

~~**STATE**~~	~~**2000**~~	~~**2001**~~	~~**2002**~~	~~**2003**~~	~~**TOTALS**~~
~~Maine~~	~~0~~	~~5~~	~~2~~	~~1~~	~~8~~
~~New Hampshire~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~
~~Massachusetts~~	~~13~~[5]	~~3~~	~~67~~[6]	~~5~~	~~94~~
~~Rhode Island~~	~~0~~	~~1~~	~~1~~	~~0~~	~~2~~
~~Connecticut~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~
~~New York~~	~~1~~	~~1~~	~~0~~	~~0~~	~~3~~
~~New Jersey~~	~~0~~	~~0~~	~~0~~	~~6~~	~~7~~
~~Delaware~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~
~~Maryland~~	~~0~~	~~0~~	~~0~~	~~0~~	~~1~~
~~Virginia~~	~~0~~	~~0~~	~~0~~	~~0~~	~~1~~
~~North Carolina~~	~~0~~	~~2~~[8]	~~0~~	~~1~~[9]	~~5~~
~~South Carolina~~	~~0~~	~~1~~	~~0~~	~~1~~[10]	~~2~~
~~Georgia~~	~~1~~	~~0~~	~~0~~	~~0~~	~~1~~
~~Florida~~	~~0~~	~~0~~	~~0~~	~~29~~[12, 13]	
~~TOTALS - U.S.~~	~~15~~	~~13~~	~~70~~	~~43~~	~~185~~
~~Nova Scotia~~[1]	~~16~~[2]	~~3~~[3]	~~7~~[4]	~~2~~	~~29~~

[1] ~~Data supplied by Tonya Wimmer, Nova Scotia Marine Animal Response Society (pers. comm.) NOTE: These strandings were NOT included in the long-finned pilot whale section, thus the table totals will be different, and will be updated in the next revision of the long-finned pilot whale stock assessment.~~

[2] ~~Includes 14 mass live strandings at Judique, Inverness County on August 6, 2000 - 11 returned to sea~~

[3] ~~Three mass live stranded animals at Judique, Inverness County on July 19, 2001 - all returned to sea~~

[4] ~~Includes 4 mass live strandings at Point Tupper, Inverness County on January 11, 2002 - fate unreported.~~

[5] ~~Includes mass stranding of 11 animals in July 2000~~

[6] ~~Includes mass stranding of 57 animals in July 2002~~

[7] ~~Two long-finned pilot whales stranded in NC in 1999, reported to species~~

[8] ~~Two pilot whales stranded in NC in 2001 not identified to species~~

[9] ~~One pilot whale stranded in NC in 2003 not identified to species. NOTE: This stranding was NOT included in the long-finned pilot whale section, thus the table totals will be different, and will be updated in the next revision of the long-finned pilot whale stock assessment.~~

[10] ~~Only moderate confidence on species identification as long-finned pilot whale~~

[11] ~~Two long-finned pilot whales reported in Florida identified to species~~

[12] ~~Includes mass live stranding of 28 short-finned pilot whales in Content Passage, Monroe County, FL (Ocean side) on April 19, 2003 - 12 animals died or were uthanized at the scene, 9 were returned to sea, 7 were taken into rehabilitation of which 2 subsequently died and 5 were released to sea on August 10, 2003. NOTE: These strandings were NOT included in the long-finned pilot whale section, thus the table totals will be different, and will be updated in the next revision of the long-finned pilot whale stock assessment.~~

~~13 Signs of human interaction reported on 1 stranded animal (not part of the live mass stranding). NOTE: These strandings were NOT included in the long-finned pilot whale section, thus the table totals will be different, and will be updated in the next revision of the long-finned pilot whale stock assessment.~~

~~14~~

STATUS OF STOCK

The status of short-finned pilot whales relative to OSP in the U.S. Atlantic EEZ is unknown, but stock abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel, and squid stocks. There are insufficient data to determine the population trends for this species. The species is not listed under the Endangered Species Act. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR, and therefore cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock cannot be determined until the trawl bycatch mortality analysis is complete (Table 2).

~~This is not a strategic stock, because the 2000-2004 1999-2003 estimated average annual fishery-related mortality, excluding Nova Scotia bycatches, to pilot whales, *Globicephala* sp., does not exceed PBR. The status has gone back and forth, because mortality has been close to PBR. In the last six editions of this stock assessment report, it has been designated as non-strategic in 1998, 1999, 2005 and this year.~~

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WHITE-SIDED DOLPHIN (*Lagenorhynchus acutus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

White-sided dolphins are found in temperate and sub-polar waters of the North Atlantic, primarily in continental shelf waters to the 100m depth contour. The species inhabits waters from central West Greenland to North Carolina (about 35˚~~E~~N) and perhaps as far east as 43˚~~E~~W (Evans 1987). Distribution of sightings, strandings and incidental takes suggest the possible existence of three stocks units: Gulf of Maine, Gulf of St. Lawrence and Labrador Sea stocks (Palka ~~et al.~~ *et al.* 1997). Evidence for a separation between the well-documented unit in the southern Gulf of Maine and a Gulf of St. Lawrence population comes from a hiatus of summer sightings along the Atlantic side of Nova Scotia. This has been reported in Gaskin (1992), is evident in Smithsonian stranding records, and was seen during abundance surveys conducted in the summers of 1995 and 1999 that covered waters from Virginia to the entrance of the Gulf of St. Lawrence. White-sided dolphins were seen frequently in Gulf of Maine waters and in waters at the mouth of the Gulf of St. Lawrence, but only a few sightings were recorded between these two regions.

The Gulf of Maine stock of white-sided dolphins is most common in continental shelf waters from Hudson Canyon (approximately 39˚~~E~~N) north through Georges Bank, and in the Gulf of Maine to the lower Bay of Fundy. Sightings data indicate seasonal shifts in distribution (Northridge ~~et al.~~ *et al.* 1997). During January to May, low numbers of white-sided dolphins are found from Georges Bank to Jeffreys Ledge (off New Hampshire), and even lower numbers are south of Georges Bank, as documented by a few strandings collected on beaches of Virginia and North Carolina. From June through September, large numbers of white-sided dolphins are found from Georges Bank to the lower Bay of Fundy. From October to December, white-sided dolphins occur at intermediate densities from southern Georges Bank to southern Gulf of Maine (Payne and Heinemann 1990). Sightings south of Georges Bank, particularly around Hudson Canyon, have been seen at all times of the year but at low densities. The Virginia and North Carolina observations appear to represent the southern extent of the species range.

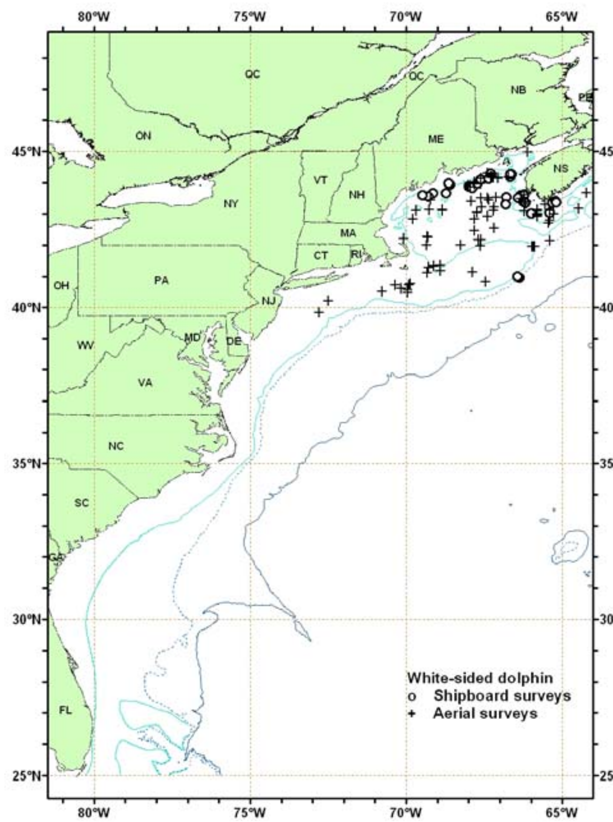

Figure 1. *Distribution of white-sided dolphins sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers in 1998, 1999, and 2004. Isobaths are the 100m, 1000m, and 4000m depth contours.*

Prior to the 1970's, white-sided dolphins in U.S. waters were found primarily offshore on the continental slope, while white-beaked dolphins (*L. albirostris*) were found on the continental shelf. During the 1970's, there was an apparent switch in habitat use between these two species. This shift may have been a result of the decrease in herring and increase in sand lance in the continental shelf waters (Katona ~~et al.~~ *et al.* 1993; Kenney ~~et al.~~ *et al.* 1996).

POPULATION SIZE

The total number of white-sided dolphins along the eastern U.S. and Canadian Atlantic coast is unknown, although five estimates from select regions are available from: 1) spring, summer and autumn 1978-1982; 2) July-September 1991-1992; 3) June-July 1993; 4) July-September 1995; and 5) July-August 1999 (Figure 1; Table 1).

An abundance of 28,600 white-sided dolphins (CV=0.21) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982).

An abundance of 20,400 (CV=0.63) white-sided dolphins was estimated from two shipboard line transect surveys conducted during July to September 1991 and 1992 in the northern Gulf of Maine-lower Bay of Fundy region (Palka ~~et al.~~ *et al.* 1997). This population size is a weighted-average of the 1991 and 1992 estimates, where each annual estimate was weighted by the inverse of its variance.

An abundance of 729 (CV=0.47) white-sided dolphins was estimated from a June and July 1993 shipboard line transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (~~Anon.~~NMFS 1993).

An abundance of 27,200 (CV=0.43) white-sided dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Palka, Unpublished~~.~~ Ms.). Total track line length was 32,600km. The ships covered waters between the 50 and 1000 fathom contours, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom line. Data collection and analysis methods used were described in Palka (1996).

An abundance of 51,640 (CV=0.38) white-sided dolphins was estimated from a 28 July to 31 August 1999 line-transect sighting survey conducted from a ship and an airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence (Table 1; Figure 1; D. Palka, Unpublished Ms.). Total track line length was 8,212km. Using methods similar to that used in the above 1995 survey, shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)* (Palka 2000). The 1999 estimate is larger than the 1995 estimate due to, at least in part, the fact that the 1999 survey covered the upper Bay of Fundy and the northern edge of Georges Bank for the first time and white-sided dolphins were seen in both areas.

Kingsley and Reeves (1998) estimated that there were 11,740 (CV=0.47) white-sided dolphins in the Gulf of St. Lawrence during 1995 and 560 (CV=0.89) white-sided dolphins in the northern Gulf of St. Lawrence during 1996 (Table 1). It is assumed these estimates apply to the Gulf of St. Lawrence stock. During the 1995 survey, 8,427km of track lines were flown in an area of 221,949km^2 during August and September. During the 1996 survey, 3,993km of track lines were flown in an area of 94,665km^2 during July and August. Data were analyzed using Quenouille's jackknife bias reduction procedure on line transect methods that model the left-truncated sighting curve. These estimates were uncorrected for visibility biases, such as *g(0)*.

The best available current abundance estimate for white-sided dolphins in the Gulf of Maine stock is 51,640 (CV=0.38) as estimated from the July to August 1999 line transect survey because this survey is recent and provided the most complete coverage of the known habitat.

Table 1. Summary of recent abundance estimates for western North Atlantic white-sided dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Gulf of Maine stock			
Jul-Aug 1999	Georges Bank to mouth of Gulf of St. Lawrence	51,640	0.38
Gulf of St. Lawrence stock			
July-Aug 1996	Northern Gulf of St. Lawrence	560	0.89

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Gulf of Maine stock of white-sided dolphins is 51,640 (CV=0.38). The minimum population estimate for these white-sided dolphins is 37,904.

Current Population Trend

There are insufficient data to determine population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include: calving interval is 2-3 years; lactation period is 18 months; gestation period is 10-12 months and births occur from May to early August, mainly in June and July; length at birth is 110cm; length at sexual maturity is 230-240cm for males, and 201-222cm for females; age at sexual maturity is 8-9 years for males and 6-8 years for females; mean adult length is 250cm for males and 224cm for females (Evans 1987); and maximum reported age for males is 22 years and for females, 27 years (Sergeant ~~et al.~~ *et al.* 1980).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow ~~et al.~~ *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 37,904. The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factor, which accounts for endangered, depleted, threatened, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5~~48~~ because this stock is of unknown status~~ and the CV of the mortality estimate is between 0.3 and 0.6~~. PBR for the Gulf of Maine stock of the western North Atlantic white-sided dolphin is 379~~364~~.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Recently, within U.S. waters, white-sided dolphins have been observed caught in the Northeast sink gillnet, Northeast~~ Atlantic~~ bottom trawl, Northeast mid-water trawl, mid-Atlantic bottom trawl, mid-Atlantic mid-water trawl, and the Gulf of Maine/Georges Bank herring trawl TALFF fisheries (Table 2). Preliminary fishery mortality estimates have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.~~Estimated average annual fishery-related mortality and serious injury to the Gulf of Maine stock of the western North Atlantic white-sided dolphin from these U.S. fisheries during 20001999-20043 was 21438 (CV=0.0939) dolphins per year plus a pending estimate from the North Atlantic trawl fisheries.~~

Earlier Interactions

In the past, incidental takes of white-sided dolphins have been recorded in the Atlantic foreign mackerel and pelagic drift gillnet, and mid-Atlantic ~~coastal~~ gillnet~~ and southern New England/mid-Atlantic squid, mackerel, butterfish trawl~~ fisheries. Fisheries information is reported in Appendix III.

NMFS observers in the Atlantic foreign mackerel fishery reported 44 takes of Atlantic white-sided dolphins incidental to fishing activities in the continental shelf and continental slope waters between March 1977 and December 1991 (Waring ~~et al.~~ *et al.* 1990; NMFS unpublished data). Of these animals, 96% were taken in the Atlantic mackerel fishery. This total includes 9 documented takes by U.S. vessels involved in joint-venture fishing operations in which U.S. captains transfer their catches to foreign processing vessels.

During 1991 to 1998, two white-sided dolphins were observed taken in the Atlantic pelagic drift gillnet fishery, both in 1993. Estimated annual fishery-related mortality and serious injury (CV in parentheses) was 4.4 (.71) in 1989, 6.8 (.71) in 1990, 0.9 (.71) in 1991, 0.8 (.71) in 1992, 2.7 (0.17) in 1993 and 0 in 1994 to 1998.

There was no fishery during 1997.

The mid-Atlantic ~~coastal~~ gillnet fishery occurs year round from New York to North Carolina and has been observed since 1993. One white-sided dolphin was observed taken in this fishery during 1997. None were observed taken in other years. The estimated annual mortality (CV in parentheses) attributed to this fishery was 0 for 1993 to 1996, 45 (0.82) for 1997, 0 for 1998 to 2001, unknown in 2002 and 0 in 2003. During 2002, the overall observer coverage was lower than usual, 1% over the entire coast, where 65% of those trips were off of Virginia and most of the rest of the area was not sampled at all. Thus, the low coverage was mostly concentrated in one time and area. In conclusion, a bycatch estimate from the unsurveyed areas cannot be confidently estimated.

~~Because of spatial and temporal differences in the harvesting of *Illex* and *Loligo* squid, and Atlantic mackerel, each of these sub-fisheries in the Southern New England/Mid-Atlantic squid, mackerel, butterfish trawl fisheries were analyzed separately. No white-sided dolphin takes have been observed taken incidental to *Illex* and *Loligo* squid fishing operations since 1996~~No incidental takes of white-sided dolphin were observed in the Atlantic mackerel JV fishery when it was observed in 1998. ~~The U.S. domestic fishery for Atlantic mackerel occurs primarily in the Southern New England and mid-Atlantic waters between the months of January and May. One white-sided dolphin incidental take was observed in 1997 and none since than. The estimated mortality in 1997 was 161 (CV=1.58) animals.~~

U.S.

Northeast Sink Gillnet

This fishery occurs year round from in the Gulf of Maine, Georges Bank and in southern New England waters. Between 1990 and 2004~~3~~ there were 49~~8~~ white-sided dolphin mortalities observed in the Northeast sink gillnet fishery. Most were taken in waters south of Cape Ann during April to December. In recent years, the majority of the takes have been east and south of Cape Cod. During 2002, one of the takes was off Maine in the fall Mid-coast Closure Area in a pingered net. Estimated annual fishery-related mortalities (CV in parentheses) were 49 (0.46) in 1991, 154 (0.35) in 1992, 205 (0.31) in 1993, 240 (0.51) in 1994, 80 (1.16) in 1995, 114 (0.61) in 1996 (Bisack 1997a), 140 (0.61) in 1997, 34 (0.92) in 1998, 69 (0.70) in 1999, 26 (1.00) in 2000, 26 (1.00) in 2001, 30 (0.74) in 2002, ~~and~~ 31 (0.93) in 2003, and ~~14~~7 (0.~~69~~98) in 2004. Average annual estimated fishery-related mortality during 2000~~1999~~-2004~~3~~ was 2~~5~~4~~36~~ white-sided dolphins per year (0.4~~1~~3~~39~~) (Table 2).

Northeast ~~Atlantic~~ Bottom Trawl

The fishery is active in New England waters in all seasons. One moderately decomposed dolphin was brought up during a monkfish trawl in April 2001 east of Cape Cod. This moderately decomposed animal could not have been killed during this haul because the haul duration was only 4.6 hours. Thirty-two~~Three~~ mortalities were documented between 1991 and 2004~~1~~ in the Northeast ~~Atlantic~~ bottom trawl fishery; 1 during 1992, ~~and~~ 2 during 1994, 1 in 2002, 14 in 2003, and 14 in 2004. The 1 white-sided dolphin taken in 1992 was in a haul that was composed of 43% cod, 20% silver hake and 17% pollock. One of the 1994 takes was in a haul that was composed of 42% white hake, 19% pollock and 16% monkfish. The other 1994 take was in a haul that kept seven species of which none were dominant. ~~One white-sided dolphin was observed taken in the Gulf Maine region during 2002 and 14 during 2003. The expanded bycatch estimate is pending.~~ In 2002, there was one take reported through the Marine Mammal Authorization Program (MMAP) that was taken in a North Atlantic bottom trawl haul. Preliminary estimates of mortality attributed to the Northeast bottom and mid-Atlantic fisheries have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

Northeast Atlantic (Gulf of Maine/Georges Bank) JV and TALFF Herring Fishery

A U.S. joint venture (JV) mid-water (pelagic) trawl fishery was conducted during 2001 on Georges Bank from August to December. No white-sided dolphins were incidentally captured. Two white-sided dolphins were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF) (Table 2). During TALFF fishing operations all nets fished by the foreign vessel are observed. The total mortality attributed to the Atlantic herring JV and TALFF mid-water trawl fisheries~~y~~ in 2001 was 2 animals (Table 2).

Northeast Mid-water Trawl Fishery (Including Pair Trawl)

The two most commonly targeted fish in this fishery are herring (94% of VTR records) and mackerel (0.4%). Thus, the observer coverage and bycatch estimates are only for these two sub-fisheries. The observer coverage in this fishery was highest during 2003 and 2004, though a few trips in earlier years were observed (Table 2). A white-sided dolphin was observed taken in the single trawl fishery on the northern edge of Georges Bank (off of Massachusetts) during July 2003 in a haul that was targeting (and primarily caught) herring. Due to small sample sizes, the bycatch rate model used all observed mid-water trawl data, including paired and single, and Northeast and mid-Atlantic mid-water trawls, that targeted either herring or mackerel and were observed between 1999 and 2004 (Palka, in prep). The model that best fit these data was a binomial logistic regression model that included target species and bottom slope as significant explanatory variables, and soak duration as the unit of effort. Estimated annual fishery-related mortalities (CV in parentheses) were 4.3 (0.74) in 1999, 4.5 (0.74) in 2000, 8.9 (0.74) in 2001, 14 (0.44) in 2002, 2.0 (0.74) in 2003, and 0.5 (0.5) in 2004 (Table 2; Palka in prep.). The average annual estimated fishery-related mortality during 2002-2004 was 6.0 (0.33).

Mid-Atlantic Mid-water Trawl Fishery (Including Pair Trawl)

The two most commonly targeted fish in this fishery are herring (54% of VTR records) and mackerel (26%). Thus, the observer coverage and bycatch estimates are only for these two sub-fisheries. The observer coverage in this fishery was highest during 2000, 2003 and 2004, though a few trips in other years were observed (Table 2). A white-sided dolphin was observed taken in the pair trawl fishery near Hudson Canyon (off New Jersey) during February 2004 in a haul that was targeting mackerel (and landed nothing). Due to small sample sizes, the bycatch rate model used all observed mid-water trawl data, including paired and single, and Northeast and mid-Atlantic mid-water trawls, that targeted either herring or mackerel and were observed between 1999 and 2004 (Palka, in prep). The model that best fit these data was a binomial logistic regression model that included target species and bottom slope as significant explanatory variables, and soak duration as the unit of effort. Estimated annual fishery-related mortalities (CV in parentheses) were 0 (0.55) in 1999, 0 (0.55) in 2000, 0 (0.55) in 2001, 9.4 (0.55) in 2002, 73 (0.55) in 2003, and 31 (0.55) in 2004 (Table 2; Palka in prep.). The average annual estimated fishery-related mortality during 2000-2004 was 23 (0.39).

Mid-Atlantic Bottom Trawl Fishery

One white-sided dolphin incidental take was observed in 1997 where the estimated mortality was 161 (CV=1.58) animals. Recently observer coverage for this fishery was around 1%, except for 2004 where it was 3% (Table 2). Preliminary estimates of mortality attributed to the Northeast bottom and mid-Atlantic fisheries have been generated for the years 2000-2004. The estimates will not be reported until scientific review is complete. The scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

Table 2. Summary of the incidental mortality of white-sided dolphins (*Lagenorhynchus acutus*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [a]	Observer Coverage [b]	Observed Mortality	Estimated ~~Mortality~~ Mortality	Estimated CVs	Mean Annual Mortality
Northeast Sink Gillnet	~~99-03~~ 00-04	1993=349 1998=301	Obs. Data Weighout Trip Logbook	~~.06,~~ .06, .04, .02, .03, .06	~~4[3], 1[3]~~1[e], ~~1[3]~~1[e], ~~1[3]~~1[e], ~~1[3]~~1[e], 1[3e]	~~69[3], 26[3]~~26[e], ~~26[3]~~26[e], ~~30[3]~~30[e], ~~31[3]~~31[e], ~~147[3e]~~	~~.70,~~1.00, 1.00, .74, .93, ~~.69~~98	2~~5~~4~~36~~ (0.43~~39~~)
North~~east~~ ~~Atlantic~~ Bottom Trawl[4d]	~~99-03~~ 00-04	~~TBD~~tbd	Obs. Data Weighout	~~.003,~~ .01, .01, .03, .04, .05	~~0,~~ 0, 0, 1, ~~14~~12, ~~14~~16	~~0,~~ ~~0, 0,~~ ~~TBD[4], TBD[4]~~tbd[c]	~~0,0, 0,~~ ~~TBD[4], TBD[4]~~ tbd[c]	tbd[c]
GOM/GB Herring Trawl-TALFF	2001	~~2[5]~~2[f]	Obs. Data	1.~~00[5]~~00[f]	2	2	0	2 (0)
Northeast Mid-water Trawl - Including Pair Trawl (Herring and Mackerel only) [d]	00-04	tbd	Obs. Data Weighout Trip Logbook	.005, .001, 0, .03, .14	0,0,0,1,0	4.5, 8.9, 14, 2.0, 0.5	.74, .74, .44, .74, .50	6.0 (0.33)
Mid-Atlantic Mid-water Trawl - Including Pair Trawl (Herring and Mackerel only) [d]	00-04	tbd	Obs. Data Weighout Trip Logbook	.08, 0, .008, .04, .12	0,0,0,0,1	0, 0, 9.4, 73, 31	.55, .55, .55, .55, .55	23 (0.39)

Mid-Atlantic Bottom Trawl[4d]	00-04	~~2002=384~~[6]	Obs. Data Weighout Trip Logbook	.01, .01, .01, .01, .03	0, 0, 0, 0, ~~1~~0	tbd[c]	tbd[c]	tbd[c]
Total								tbd

a Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast ~~Fisheries Science Center (NEFSC) Sea Sampling~~Observer Program. NEFSC collects landings data (Weighout) that are used as a measure of total effort in the Northeast gillnet fishery. Mandatory Vessel Trip Report (VTR) (Trip Logbook) data are used to determine the spatial distribution of fishing effort in the sink gillnet fishery and in the two mid-water trawl fisheries. In addition, the Trip Logbooks are the primary source of the measure of total effort (soak duration) in the two mid-water trawl fisheries.

b Observer coverage for the Northeast sink gillnet is measured in metric tons of fish landed.~~ and both~~ Observer coverage of the trawl fisheries are measured in trips.

c Preliminary estimates of mortality attributed to the Northeast bottom and mid-Atlantic fisheries have been generated for the years 2000-2004 but scientific review of the analysis is not complete. Therefore, mortality estimates are not reported in the bycatch table. Scientific review will be completed prior to the commencement of the Atlantic trawl take reduction team meeting in September 2006.

d A new method was used to develop preliminary estimates of mortality for the mid-Atlantic and Northeast bottom trawl fisheries during 2000-2004. They are a product of bycatch rates predicted by covariates in a model framework and effort reported by commercial fishermen on mandatory vessel logbooks. This method differs from the previous method used to estimate mortality in these fisheries prior to 2000. Therefore, the estimates reported prior to 2000 can not be compared to estimates during 2000-2004. In addition, the fisheries listed in Table 2 reflect new definitions defined by the proposed List of Fisheries for 2005 (FR Vol. 69, No. 231, 2004). The 'North Atlantic bottom trawl' fishery is now referred to as the 'Northeast bottom trawl. The Illex, Loligo and Mackerel fisheries are now part of the mid-Atlantic and Northeast bottom trawl fisheries.

~~3~~ e After 1998, a weighted bycatch rate was applied to effort from both pingered and non-pingered hauls within the stratum where white-sided dolphins were observed taken. During the years 1997, 1999, 2001, ~~and~~ 2002, and 2004, respectively, there were 2, 1, 1,~~ and~~ 1, and 1 observed white-sided dolphins taken on pingered trips. No takes were observed on pinger trips during 1995, 1996, 1998 and 2000.~~TBD = To Be Determined. Estimating mortality attributed to the North The estimated mortality attributed to the Northeast and Mid-AtlanticAtlantic bottom trawl fisheriesy is in progress. are considered preliminary. A new method (regression modeling) was used and further modifications are expected. The final analysis will be prepared for scientific review prior to the Atlantic trawl Take Reduction Team meeting scheduled for September 2006.~~

~~5~~f There were two foreign vessels that harvested Atlantic h~~H~~erring in the U.S. fishery under a TALFF quota. During TALFF fishing operations all nets fished by the foreign vessel are observed.

~~6 These are numbers of potential fishing vessels based on permit holders in the 2002 fishery. Many of these vessels participate in the other fisheries and therefore the reported number of vessels are not additive across the squid, mackerel and butterfish fisheries. (67FR 65937).~~

CANADA

There is little information available that quantifies fishery interactions involving white-sided dolphins in Canadian waters. Two white-sided dolphins were reported caught in groundfish gillnet sets in the Bay of Fundy during 1985 to 1989, and 9 were reported taken in West Greenland between 1964 and 1966 in the now non-operational salmon drift nets (Gaskin 1992). Several (number not specified) were also taken during the 1960's in the now non-operational Newfoundland and Labrador groundfish gillnets. A few (number not specified) were taken in an experimental drift gillnet fishery for salmon off West Greenland which took place from 1965 to 1982 (Read 1994).

Hooker ~~et al.~~ *et al.* (1997) summarized bycatch data from a Canadian fisheries observer program that placed observers on all foreign fishing vessels operating in Canadian waters, on between 25-40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. Bycaught marine mammals were noted as weight in kilos rather than by the numbers of animals caught. Thus the number of individuals was estimated by dividing the total weight per species per trip by the maximum recorded weight of each species. During 1991 through 1996, an estimated 6 white-sided dolphins were observed taken. One animal was from a longline trip south of the Grand Banks (43º 10'N 53º 08'W) in November 1996 and the other 5 were taken in the bottom trawl fishery off Nova Scotia in the Atlantic Ocean; 1 in July 1991, 1 in April 1992, 1 in May 1992, 1 in April 1993, 1 in June 1993 and 0 in 1994 to 1996.

Estimation of small cetacean bycatch is currently underway for Newfoundland fisheries using data collected during 2001 to 2003 (pers. comm. J. Lawson, DFO). White-sided dolphins were reported to have been caught in the Newfoundland nearshore gillnet fishery and offshore monkfish/skate gillnet fisheries.

Herring Weirs

During the last several years, one white-sided dolphin was released alive and unharmed from a herring weir in the Bay of Fundy (A. Westgate, pers. comm.). Due to the formation of a cooperative program between Canadian fishermen and biologists, it is expected that most dolphins and whales will be able to be released alive. Fishery information is available in Appendix III.

Other Mortality

U.S.

Mass strandings involving up to a hundred or more animals at one time are common for this species. From 1968 to 1995, 349 Atlantic white-sided dolphins were known to have stranded on the New England coast (Hain and Waring 1994; Smithsonian stranding records 1996). The causes of these strandings are not known. Because such strandings have been known since antiquity, it could be presumed that recent strandings are a normal condition (Gaskin 1992). It is unknown whether human causes, such as fishery interactions and pollution, have increased the number of strandings. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

White-sided dolphin stranding records from 1997~~ to 2003~~ that are in the NMFS/NE Regional Office strandings and entanglement database have been reviewed and~~,~~ updated. The most recent five years are~~, and~~ reported in Table 3. Cause of death was investigated and it was determined that the documented human interaction were as follows: 1 animal possibly killed by a boat collision off Maine during 2001; 2 animals with indications of fishery interactions found in March 2002 in Massachusetts; and 1 animal with indications of fishery interactions found in May 2002 in Virginia, 1 animal with indications of fishery interactions was found in Massachusetts during 2004, and one animal during 2004 was found with twine blocking its esophagus (thus, this is a human interaction, but not necessarily a fishery interaction) (Table 3).

Mass strandings in Massachusetts occur frequently (Table 3). There were 80 animals in a mass stranding near Wellfleet, Massachusetts, during the week of 29 January to 3 February 1998. Of these, 2 were released alive. Of the 4 found in Massachusetts during the November 1998 mass stranding, 1 was released alive. Fifty-three animals stranded in Wellfleet, Massachusetts during 19-24 March 1999. During 1999, of the 70 strandings, 38 were found alive, and 3 of these animals were released alive. During 2000, 5 were found alive (3 in April and 2 in August), and the 2 in August were released alive. During 2002, there were mass strandings in March and August, of which a few were released alive. During 2003 in Massachusetts 36 white-sided dolphins were involved in mass strandings in January, April and November, of which 25 were found alive. There were no mass strandings in 2004.

CANADA

Small numbers of white-sided dolphins have been taken off southwestern Greenland and they have been taken deliberately by shooting elsewhere in Canada (Reeves ~~et al.~~ *et al.* 1999). The Nova Scotia Stranding Network documented whales and dolphins stranded on the coast of Nova Scotia during 1991 to 1996 (Hooker ~~et al.~~ *et al.* 1997). Researchers with Dept. of Fisheries and Oceans (DFO), Canada documented strandings on the beaches of Sable Island during 1970 to 1998 (Lucas and Hooker 2000). Sable Island is approximately 170km southeast of mainland Nova Scotia. White-sided dolphins stranded at nearly all times of the year on the mainland and on Sable Island. On the mainland of Nova Scotia, a total of 34 stranded white-sided dolphins was recorded between 1991 and 1996: 2 in 1991 (August and October), 26 in July 1992, 1 in Nov 1993, 2 in 1994 (February and November), 2 in 1995 (April and August) and 2 in 1996 (October and December). During July 1992, 26 white-sided dolphins stranded on the Atlantic side of Cape Breton. Of these, 11 were released alive and the rest were found dead. Among the rest of the Nova Scotia strandings, 1 was found in Minas Basin, 2 near Yarmouth and the rest near Halifax. On Sable Island, 10 stranded white-sided dolphins were documented between 1991 and 1998; all were males, 7 were young males (< 200cm), 1 in January 1993, 5 in March 1993, 1 in August 1995, 1 in December 1996, 1 in April 1997 and 1 in February 1998.

Whales and dolphins stranded between 1997 and 2004 on the coast of Nova Scotia as recorded by the Marine Animal Response Society (MARS) and the Nova Scotia Stranding Network are as follows (Table 3): 0 white-sided dolphins stranded in 1997 to 2000, 3 in September 2001 (released alive), 5 in November 2002 (4 were released alive), 0 in 2003, and 19-24 in 2004 (15-20 in October (some (unspecified) were released alive) and 4 in November were released alive).

~~Table 3. Summary of number of stranded white-sided dolphins during January 1, 2000~~~~1999 to December 31, 2004~~~~3, by year and area within U.S. and Canada.~~

Table 3. Summary of number of stranded white-sided dolphins during January 1, 2000 to December 31, 2004, by year and area within U.S. and Canada.

Area	Year					Total
	2000	2001	2002	2003	2004	
~~Maine[2]~~Maine[b]		2	4	2	10	18
New Hampshire						
~~Massachusetts[1]~~Massachusetts[a,~~2~~b]	24	16	53	59	34	186
Rhode Island			2			2
Connecticut				1		1
New York			1	2	1	4
New Jersey			1	1	1	3
Delaware						
Maryland						
Virginia[2]			1		4	5
North Carolina				1	2	3
TOTAL US	24	18	62	66	52	222
Nova Scotia	0	3	6	0	2	11
GRAND TOTAL	24	21	68	66	54	233

[a] Records of mass strandings in Massachusetts are: March 1999 - 53 animals; April 2000 - 5 animals; August 2000 - 11 animals; April 2001 - 6 animals; March 2002 - 31 animals, of which 7 were released alive; August 2002 - 3 animals, of which 1 was released alive; January 2003 - 4 animals; April 2003 - 28 animals; November 2003 - 4 animals.

[b] Strandings that appear to involve a human interaction are: 1 animal from Maine in 2001 that was a possible boat collision; 1 animal from Virginia in May 2002 had signs of fishery interaction; 2 animals from Massachusetts in March 2002 had signs of fishery interactions; 1 animal from Massachusetts in 2004 was a fishery interaction; and 1 other animal from Massachusetts in 2004 was found with twine obstructing its esophagus

~~[1] Records of mass strandings in Massachusetts are: March 1999 - 53 animals; April 2000 - 5 animals; August 2000 - 11 animals; April 2001 - 6 animals; March 2002 - 31 animals, of which 7 were released alive; August 2002 - 3 animals, of which 1 was released alive; January 2003 - 4 animals; April 2003 - 28 animals; November 2003 - 4 animals.~~

~~[2] Strandings that appear to involve a human interaction are: 1 animal from Maine in 2001 that was a possible boat collision; 1 animal from Virginia in May 2002 had signs of fishery interaction; and 2 animals from Massachusetts in March 2002 had signs of fishery interactions; 1 animal from Massachusetts in 2004 was a fishery interaction; and 1 other animal from Massachusetts in 2004 was found with twine obstructing its esophagus.~~

STATUS OF STOCK

The status of white-sided dolphins, relative to OSP, in the U.S. Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock cannot be determined until the trawl bycatch mortality analysis is complete (Table 2).

~~This is a non-strategic stock because estimated average annual fishery-related mortality and serious injury does not exceed PBR.~~

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WHITE-BEAKED DOLPHIN (*Lagenorhynchus albirostris*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

White-beaked dolphins are the more northerly of the two species of *Lagenorhynchus* in the northwest Atlantic (Leatherwood *et al.*1976). The species is found in waters from southern New England, north to western and southern Greenland and Davis Straits (Leatherwood *et al.*1976; CETAP 1982), in the Barents Sea and south to at least Portugal (Reeves *et al.*1999). Differences in skull features indicate that there are at least two separate stocks, one in the eastern and one in the western North Atlantic (Mikkelsen and Lund 1994). No genetic analyses have been conducted to distinguish the stock structure.

In waters off the northeastern U.S. coast, white-beaked dolphin sightings have been concentrated in the western Gulf of Maine and around Cape Cod (CETAP 1982). The limited distribution of this species in U.S. waters has been attributed to opportunistic feeding (CETAP 1982). Prior to the 1970's, white-sided dolphins (*L. acutus*) in U.S. waters were found primarily offshore on the continental slope, while white-beaked dolphins were found on the continental shelf. During the 1970's, there was an apparent switch in habitat use between these two species. This shift may have been a result of the increase in sand lance in the continental shelf waters (Katona *et al.*1993; Kenney *et al.*1996).

More recently, during late March of 2001, one group of 18 animals was seen about 60 nautical miles east of Provincetown, MA during a ~~NEFSC~~ NMFS aerial marine mammal survey (~~NEFSC~~ NMFS unpublished data). In addition, during spring 2001 and 2002, white-beaked dolphins stranded on beaches in New York and Massachusetts (see Other Mortality section below).

POPULATION SIZE

The total number of white-beaked dolphins in U.S. and Canadian waters is unknown, although one old abundance estimate is available for part of the known habitat in U.S. waters, and two old estimates are available from Canadian waters (Table 1).

A population size of 573 white-beaked dolphins (CV=0.69) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (Table 1; CETAP 1982). The estimate is based on spring data because the greatest proportion of the population off the northeast U.S. coast appeared in the study area during this season, according to the CETAP data. This estimate does not include a correction for dive-time or g*(0)*, the probability of detecting an animal group on the track line. This estimate may not reflect the current true population size because of its high degree of uncertainty (e.g., large CV), its old age, and it was estimated just after cessation of extensive foreign fishing operations in the region.

A population size of 5,500 white-beaked dolphins was based on an aerial survey off eastern Newfoundland and southeastern Labrador (Table 1; Alling and Whitehead 1987).

A population size of 3,486 white-beaked dolphins (95% confidence interval (CI)=2,001-4,971) was estimated from a ship-based survey of a small segment of the Labrador Shelf in August 1982 (Table 1; Alling and Whitehead 1987). A CV was not given, but assuming a symmetric CI, it would be 0.22.

There are no recent abundance estimates for this species in waters between the Gulf of Maine and the Newfoundland/Labrador region.

Table 1. Summary of abundance estimates for western North Atlantic white-beaked dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
spring 1978-82	Cape Hatteras, NC to Nova Scotia	573	0.69
1980's	E. Newfoundland and SE Labrador	5,500	None reported
August 1982	Labrador shelf	3,486	0.22

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate in U.S. Exclusive Economic Zone (EEZ) waters.

Current Population Trend

There are insufficient data to determine population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.*1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (Wade and Angliss 1997). The minimum population size of white-beaked dolphins is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic white-beaked dolphin is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

White-beaked dolphins have been taken in cod traps and the Canadian groundfish gillnet fisheries off Newfoundland and Labrador and in the Gulf of St. Lawrence (Alling and Whitehead 1987; Read 1994; Hai *et al.*1996); however, the total number of animals taken is not known. Of three bycaught white-beaked dolphins reported off Newfoundland during 1987-1988, 1 died in a groundfish gill net, 1 in a herring gill net, and 1 in a cod trap (Reeves *et al.*1999).

There are no documented reports of fishery-related mortality or serious injury to this stock in the U.S. EEZ. A white-beaked dolphin was picked up by a Northeast bottom trawl in March 2003. However, since the animal was moderately decomposed and the trawl duration was short, the animal could not have died in this trawl.

Fishery Information

Because of the absence of observed fishery-related mortality and serious injury to this stock in the U.S. and Canadian waters, no fishery information is provided.

Other Mortality

White-beaked dolphins were hunted for food by residents in Newfoundland and Labrador (Alling and Whitehead 1987). These authors, based on interview data, estimated that 366 white-beaked dolphins were taken each year. The same authors reported that 25-50% of the killed dolphins were lost. Hunting that now occurs in Canadian waters is believed to be opportunistic and in remote regions of Labrador where enforcement of regulations is minimal (Lien *et al.*2001).

White-beaked dolphins regularly become caught in ice off the coast of Newfoundland during years of heavy pack ice. A total of 21 ice entrapments involving approximately 350 animals were reported in Newfoundland from 1979 to 1990; known mortality as a result of entrapment was about 55% (Lien *et al.*2001).

Mass strandings of white-beaked dolphins are less common than for white-sided dolphins. White-beaked dolphins more commonly strand as individuals or in small groups (Reeves *et al.*1999). In Newfoundland, 5 strandings of white-beaked dolphins between 1979 and 1990 involved groups of 2 to 7 animals. On three occasions live dolphins came ashore, including groups of 3 and 4 (Reeves *et al.*1999).

White-beaked dolphin stranding records from 1997 ~~to 2003~~ that are in the US NE Regional Office/NMFS strandings and entanglement database include five~~four~~ records that clearly identify the species to be the white-beaked dolphin (Table 2). Three of these strandings were collected from Cape Cod, Massachusetts beaches, where 1 animal stranded during May 1997, and 2 animals stranded during March 2001. ~~The fourth~~A white-beaked dolphin stranded in New York in February 2002. No white-beaked dolphins stranded during 2003. One white-beaked dolphin stranded in Maine during May 2004. It was not possible to determine the cause of death for any of these stranded animals.

Whales and dolphins stranded between 1997 and 2004 on the coast of Nova Scotia as recorded by the Marine Animal Response Society (MARS) and the Nova Scotia Stranding Network are as follows: 1 white-beaked dolphin stranded in May 1997, 0 documented strandings in 1998 to 2001, ~~and~~ 2 in 2002 (1 in July (released alive) and 1 in August), and 0 in 2003 and 2004 (Table 2).

Table 2. Summary of number of stranded white-beaked dolphins during January 1, 2000 to December 31, 2004, by year and area within U.S. and Canada.

Area	**Year**					**Total**
	2000	2001	2002	2003	2004	
Maine					1	1
Massachusetts		2				2
New York			1			1
TOTAL US	**0**	**2**	**1**	**0**	**1**	**4**
Nova Scotia[a]	0	0	2	0	0	2
GRAND TOTAL	**0**	**2**	**3**	**0**	**1**	**6**

a. One animal that stranded in July 2002 was released alive.

STATUS OF STOCK

The status of white-beaked dolphins, relative to OSP, in U.S. Atlantic coast waters is unknown. They are not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species. Because there are insufficient data to calculate PBR it is not possible to determine if stock is strategic and if the total fishery-related mortality and serious injury for this stock is significant and approaching zero mortality and serious injury rate. However, because this stock has a marginal occurrence in U.S. waters and there are no documented takes in U.S. waters, this stock has been designated as not strategic.

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BOTTLENOSE DOLPHIN (*Tursiops truncatus*): Western North Atlantic Coastal Morphotype Stocks

STOCK DEFINITION AND GEOGRAPHIC RANGE

Stock Structure of the Coastal Morphotype

A. Latitudinal distribution and structure along the coast

The coastal morphotype of bottlenose dolphin is continuously distributed along the Atlantic coast south of Long Island, around the Florida peninsula and along the Gulf of Mexico coast. On the basis of differences in mitochondrial DNA haplotype frequencies, ~~Curry (1997) concluded that the~~ nearshore animals in the northern Gulf of Mexico and the western North Atlantic represent separate stocks (Curry 1997; Duffield and Wells 2002).

Scott ~~et al.~~*et al.* (1988) hypothesized a single coastal migratory stock ranging seasonally from as far north as Long Island, NY, to as far south as central Florida, citing stranding patterns during a high mortality event in 1987-88 and observed density patterns along the US Atlantic coast. More recent studies indicate that the single coastal migratory stock hypothesis is incorrect, and there is a complex mosaic of stocks (NMFS 2001; McLellan ~~et al.~~*et al.* 2003).

Recent genetic analyses of samples from ~~Jacksonville, Fl~~northern Florida, Georgia, central South Carolina (primarily the estuaries around Charleston), southern North Carolina, and coastal Virginia, using both mitochondrial DNA and nuclear microsatellite markers, indicate that a significant amount of the overall genetic variation can be explained by differences between these areas (NMFS 2001). These results indicate a minimum of five stocks of coastal bottlenose dolphins along the US Atlantic coast and reject the null hypothesis of one homogeneous population.

Photo-identification studies also support the existence of multiple stocks (NMFS 2001). A coastwide photographic catalogue has been established using contributions from 15 sites from Cape May, NJ, to Cape Canaveral, FL (Urian ~~et al.~~*et al.* 1999). No matches have been found between the northernmost and southernmost sites. However, there appears to be a high rate of exchange among northern field sites, where dolphins occur only seasonally, and central North Carolina. Other areas of frequent exchange include Beaufort and Wilmington, NC. In contrast to the patterns found in the northern end of the range, there appears to be less movement between southern field sites. There are only two confirmed matches between the relatively large catalogs of Jacksonville, FL, and Hilton Head, SC, for example, and no matches between the Charleston, SC site and other sites.

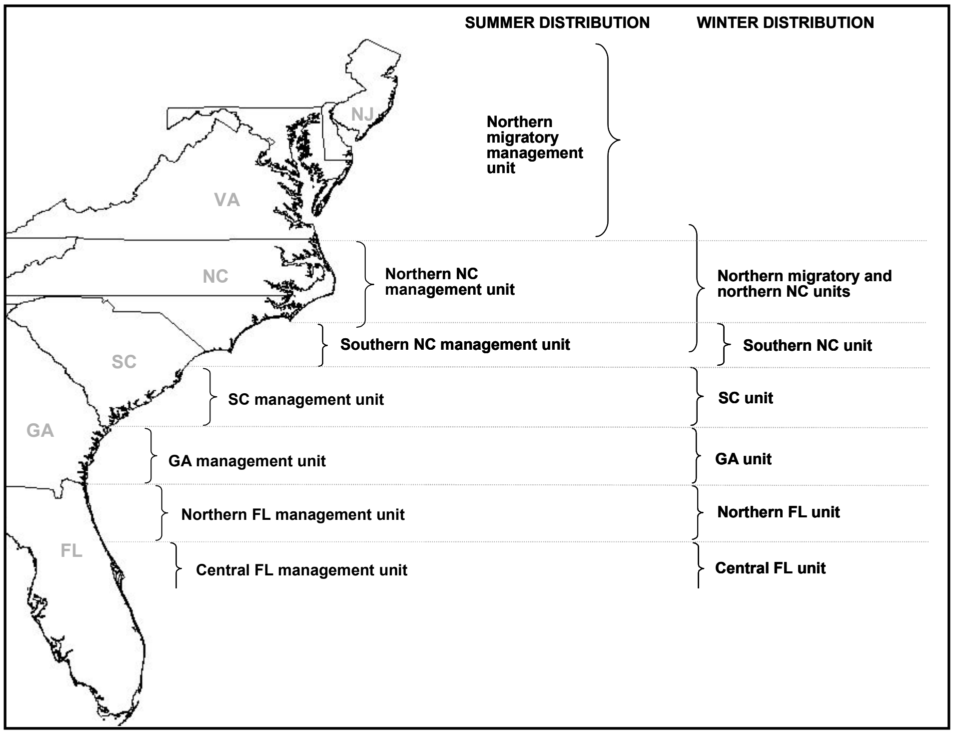
Satellite-linked radio transmitters have been deployed on dolphins in Virginia Beach, VA, Beaufort, NC, Charleston, SC and New Jersey. The movement patterns of animals with satellite tags provide additional information complementary to other stock identification approaches. The results, along with photo-identification of freeze-branded animals, indicate that a significant number of dolphins reside in ~~NC~~ North Carolina in summer and do not migrate. A dolphin tagged in Virginia Beach, VA, spent the winter between Cape Hatteras and Cape Lookout, NC., ~~-~~indicating seasonal migration between North Carolina and areas further north (NMFS 2001).

Another potential stock has been identified from stable isotope ratios of oxygen (NMFS 2001). Animals sampled along the beaches of North Carolina between Cape Hatteras and Bogue Inlet during February and March show very low stable isotope ratios of ^{18}O relative to ^{16}O (referred to as depleted ^{18}O or depleted oxygen, Cortese 2000). One possible explanation for the depleted oxygen signature is a resident group of dolphins in Pamlico Sound that move into nearby nearshore areas in the winter. The possibility of a resident group of bottlenose dolphins in Pamlico Sound is supported by results from satellite telemetry and photo-identification results. Alternatively, these animals may represent a component of the migratory animals that spend their summers at the northernmost end of the range of bottlenose dolphins and winter in North Carolina. Either possibility suggests that they represent a separate stock.

There are additional resident estuarine stocks that are likely demographically distinct from coastal stocks, but they are currently included in the coastal management unit definitions. For example, year-round resident populations have been reported at a variety of sites from Charleston, ~~South Carolina~~SC (Zolman 1996) to central Florida (Odell and Asper 1990). Seasonal residents and migratory or transient animals also occur in these areas (summarized in Hohn 1997). In the northern part of the range, the patterns reported include seasonal residency, year-round residency with large home ranges, and migratory or transient movements (Barco and Swingle 1996~~, Sayigh et al.~~*et al.* ~~1997~~). Communities of dolphins have been recognized in embayments and coastal areas of the Gulf of Mexico (Wells ~~et al.~~*et al.* 1987, Wells ~~et al.~~*et al.* 1996; Scott ~~et al.~~*et al.* 1990; Weller 1998), and it is not surprising to find similar situations along the Atlantic coast.

In summary, integration of the results from genetic, photo-identification, satellite telemetry, and stable isotope studies confirms a complex mosaic of coastal bottlenose dolphin stocks. Therefore, seven management units within the range of the coastal morphotype of western North Atlantic bottlenose dolphin have been defined (Figure 1). The true population structure is likely more complex than the seven units identified in this report, and research efforts continue to identify that structure.

Figure 1. Management units of the coastal morphotype of bottlenose dolphin along the Atlantic coast of the US as defined from genetic, stable isotope ratio, photo-identification, and telemetry studies (NMFS 2001).



B. Longitudinal distribution

Aerial surveys conducted between 1978 and~~-~~1982 (CETAP 1982) north of Cape Hatteras, North Carolina identified two concentrations of bottlenose dolphins, one inshore of the 25 m isobath and the other offshore of the 50~~-~~m isobath. The lowest density of bottlenose dolphins was observed over the continental shelf, with higher densities along the coast and near the continental shelf edge. It was suggested, therefore, that the coastal morphotype is restricted to waters < 25 m ~~depth~~ deep north of Cape Hatteras (Kenney 1990). Similar patterns were observed during summer months north of Cape Lookout, ~~North Carolina~~NC in more recent aerial surveys (Garrison and Yeung 2001; Garrison ~~et al.~~*et al.* 2003). However, south of Cape Lookout during both winter and summer months, there was no clear longitudinal discontinuity in bottlenose dolphin sightings (Garrison and Yeung 2001; Garrison ~~et al.~~*et al.* 2003).

Dolphin groups observed during aerial surveys cannot be attributed to a specific morphotype based on sighting information alone. Genetic analysis of tissue samples can be used to identify animals to a specific morphotype (Hoelzel ~~et al.~~*et al.* 1998, P. Rosel SEFSC unpublished results). An analysis of tissue samples from large vessel surveys during the summers of 1998 and 1999 indicated that bottlenose dolphins within 7.5 km from shore were most likely of the coastal morphotype, and there was an extensive region of overlap between the coastal and offshore morphotypes between 7.5 and 34 km from shore south of Cape Hatteras, NC (Torres ~~et al.~~*et al.* 2003). However, relatively few samples were available from the region of overlap, and therefore the longitudinal boundaries based on these initial analyses are uncertain (Torres ~~et al.~~*et al.* 2003). Extensive systematic biopsy sampling efforts were conducted in the summers of 2001 and 2002 to supplement collections from large vessel surveys. During the winters of 2002 and 2003, additional biopsy collection efforts were conducted in nearshore continental shelf waters of North Carolina and Georgia. A small number of additional biopsy samples were collected in deeper continental shelf waters south of Cape Hatteras during winter 2002. Genetic analyses of these biopsies identified individual animals to the coastal or offshore morphotype. Based upon the genetic results from all surveys combined, a logistic regression approach was used to model the probability that a particular bottlenose dolphin group is of the coastal morphotype as a function of environmental variables including depth, sea surface temperature, and distance from shore. These models were used to partition the bottlenose dolphin groups observed during aerial surveys between the two overlapping morphotypes (Garrison ~~et al.~~*et al.* 2003).

The genetic results and spatial patterns observed in aerial surveys indicate both regional and seasonal differences in the longitudinal distribution of the two morphotypes in coastal Atlantic waters. North of Cape Lookout, ~~North Carolina~~NC (i.e., northern migratory and northern North Carolina management units) during summer months, the previously observed pattern of strong nearshore aggregation of bottlenose dolphins was again observed. All biopsy samples collected from nearshore waters (< 20 m ~~depth~~deep) were of the coastal morphotype and all samples collected in deeper waters (> 40 m ~~depth~~deep) were of the offshore morphotype. The genetic results confirm separation of the two populations in this region during summer months. South of Cape Lookout, NC, the probability of an observed bottlenose dolphin group being of the coastal morphotype declined with increasing depth; however, there was significant spatial overlap between the two morphotypes. Offshore morphotype bottlenose dolphins were observed at depths as shallow as 13 m, and coastal morphotype dolphins were observed at depths of 31 m and 75 km from shore (Garrison ~~et al.~~*et al.* 2003). These results indicate significant overlap between the two morphotypes in the southern management units during summer months.

Winter samples were collected primarily from nearshore waters in North Carolina and Georgia. The vast majority of samples collected in nearshore waters of North Carolina during winter were of the coastal morphotype; however, one offshore morphotype group was sampled during November just south of Cape Lookout, North Carolina only 7.3 km from shore. Coastal morphotype samples were also collected further away from shore at 33 m depth and 39 km from shore. The logistic regression model for this region indicated a decline in the probability of a coastal morphotype group with increasing distance from shore; however, the model predictions are highly uncertain due to limited sample sizes and high overlap between the two morphotypes. Samples collected in Georgia waters also indicated significant overlap between the two morphotypes with a declining probability of the coastal morphotype with increasing depth. A coastal morphotype sample was collected well offshore at a distance of 112 km from shore and a depth of 38 m. An offshore sample was collected in 22 m depth at 40 km from shore. As with the North Carolina model, the Georgia logistic regression predictions are uncertain due to limited sample size and high overlap between the two morphotypes (Garrison ~~et al.~~*et al.* 2003). The logistic regression models were used to predict the probability that an observed bottlenose group is of the coastal morphotype as a function of habitat variables and spatial location. There remain significant sampling gaps in the biopsy collections, particularly during winter months, that increase the uncertainty of model predictions. Both the predicted probability of a coastal morphotype occurring and the associated uncertainty in that prediction are incorporated into the abundance estimates for coastal morphotype bottlenose dolphin management units.

POPULATION SIZE

Previous abundance estimates for the coastal morphotype of WNA bottlenose dolphin were based primarily upon aerial surveys conducted during the summer and winter of 1995. The surveys were designed based upon the previous assumption of a single coastal migratory stock, and therefore they did not provide complete seasonal and spatial coverage for the more recently defined management units. Previous abundance estimates were also not corrected for visibility bias (Garrison and Yeung 2001). Aerial surveys to update the abundance estimates were conducted during winter (January-February) and summer (July-August) of 2002. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40 m. The surveys employed a stratified design so that most effort was expended in waters shallower than 20 m ~~depth~~ deep where a high proportion of observed bottlenose dolphins were expected to be of the coastal morphotype. Survey effort was also stratified to optimize coverage in seasonal management units. The surveys employed two observer teams operating independently on the same aircraft to estimate visibility bias.

The winter survey included the region from the Georgia/Florida state line to the southern edge of Delaware Bay. A total of 6,411 km of trackline was completed during the survey, and 185 bottlenose dolphin groups were sighted including 2,114 individual animals. No bottlenose dolphins were sighted north of Chesapeake Bay corresponding to water temperatures <9.5 EC. During the summer survey, 6,734 km of trackline were completed between Sandy Hook, NJ ~~to~~ and Ft. Pierce, FL. All tracklines in the 0-20 m stratum~~,~~ were completed throughout the survey range while offshore lines were completed only as far south as the Georgia-Florida state line. A total of 185 bottlenose dolphin groups ~~were~~ was sighted during summer including 2,544 individual animals.

Abundance estimates for bottlenose dolphins in each management unit were calculated using line transect methods and distance analysis (Buckland ~~et al.~~*et al.* 2001). The independent and joint estimates from the two survey teams were used to quantify the probability that animals available to the survey on the trackline were missed by the observer teams, or perception bias, using the direct duplicate estimator (Palka, 1995). These estimates were further partitioned between the coastal and offshore morphotypes based upon the results of the logistic regression models and spatial analyses described above. A parametric bootstrap approach was used to incorporate the uncertainty in the logistic regression models into the overall uncertainty in the abundance estimates for each management unit (Garrison ~~et al.~~*et al.* 2003).

The aerial surveys included only animals in coastal waters, and the resulting abundance estimates therefore do not include animals inside estuaries that are currently included in the defined management units. An abundance estimate was generated for bottlenose dolphins in estuaries from the North Carolina-South Carolina border to northern Pamlico Sound using mark-recapture methodology (Read ~~et al.~~*et al.* 2003), and these estimates were post-stratified to be consistent with management unit definitions (Palka ~~et al.~~*et al.* 2001a; Table 1). Since abundance estimates do not exist for all estuarine waters, the population estimates and PBRs for these management units are negatively biased.

Bottlenose dolphins in the northern migratory stock migrate south during winter months and overlap with those from the northern North Carolina and southern North Carolina management units. It is not possible at this time to apportion the incidental mortality occurring during winter months in North Carolina waters among animals from these three management units. Therefore, a half-year PBR value is applied for each management unit in the summer based upon abundance estimates from summer aerial surveys. During winter months, these three stocks overlap spatially and a half-year PBR is applied to the North Carolina mixed management unit based upon winter aerial survey abundance estimates. For the South Carolina and Georgia management units, the abundance estimates, minimum population size values, and the resulting PBR values are derived using a weighted average of abundance estimates from the winter and summer 2002 aerial surveys. The northern Florida management unit was only surveyed during the summer of 2002 and the winter of 1995. The resulting abundance estimate is therefore a weighted average of the seasonal estimates from the available surveys. Finally, the central Florida management unit was only covered during the 1995 surveys. Due to the age of the available abundance estimates, the PBR of the northern and central Florida management units were set to "undefined".

Table 1. Estimates of abundance and the associated CV, N_{min}, and PBR for each stock of WNA coastal bottlenose dolphins (Garrison ~~et al.~~*et al.* 2003). The PBR for the Northern Migratory, Northern NC, and Southern NC management units are applied semi-annually. South of NC, the PBR is applied annually. Except where noted, abundance estimates and PBR values do not include estuarine animals. The recovery factor (Fr) used to calculate PBR for each stock is based upon the CV of the abundance estimate based on the guidelines in Wade and Angliss (1997).

Unit		Best Abundance		N_{min}	Recovery Factor (Fr)	PBR	
		Estimate	CV			Annual	½ Yr
SUMMER (May - October)							
Northern migratory		17,466	0.19	14,621	0.50	(146.2)	73.1
Northern NC							
	oceanic	6,160	0.52	3,255	0.48	(31.2)	15.6

	Estuary[d]	919	0.13	828	0.50	(8.2)	4.2
	BOTH	7,079	0.45	4,083	0.48	(39.2)	19.6
Southern NC							
	oceanic	3,645	1.11	1,863	0.40	(14.9)	7.5
	Estuary[d]	141	0.15	124	0.50	(1.2)	0.6
	BOTH	3,786	1.07	1,987	0.40	(15.9)	7.9
WINTER (November - April)							
NC mixed[a]		16,913	0.23	13,558	0.50	(135.6)	67.8
ALL YEAR							
South Carolina		2,325	0.20	1,963	0.50	19.6	na
Georgia		2,195	0.30	1,716	0.50	17.2	na
Northern Florida[b,c]		448	0.38	na	na	na	na
Central Florida[c]		10,652	0.46	na	na	na	na

a. NC mixed = northern migratory, Northern NC, and Southern NC
b. Northern Florida estimates are a weighted mean of abundance estimates from the winter 1995 survey and the summer 2002 survey. Due to the age of the winter abundance estimate, PBR cannot be calculated for this stock.
c. Northern and Central Florida estimates include data from the winter 1995 survey and cannot be used to determine PBR due to their age.
d. Read ~~et al.~~*et al.* 2003

Minimum Population Estimate

The minimum population size (Nmin) for each stock was calculated as the lower bound of the 60% confidence interval for a lognormally distributed mean (Wade and Angliss 1997). For the estimates derived from bootstrap resampling, the appropriate Nmin was taken directly from the bootstrap distribution of abundance estimates. These estimates may be negatively biased because they do not include estuarine animals and do not fully account for visibility bias. Minimum population sizes for each stock are shown in Table 1.

Current Population Trend

There are insufficient data to determine the population trend for these stocks .

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the WNA coastal morphotype. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow ~~et al.~~*et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (Wade and Angliss 1997). ~~The recovery factor is 0.50, the default for depleted stocks and stocks of unknown status.~~ This complex of management units incorporates the range of the former WNA coastal migratory stock that was defined as depleted under MMPA guidelines. At least some of these management units are likely depleted relative to their optimum sustainable population (OSP) size due both to mortality during the 1987-1988 die-off and high incidental mortality in fisheries relative to PBR. Given the known population structure within the coastal morphotype bottlenose dolphins, it is appropriate to apply PBR separately to each management unit so as to achieve the goals of the MMPA (Wade and Angliss 1997).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total estimated average annual fishery related mortality during 1996-2000 was 233 bottlenose dolphins (CV=0.16) in the mid-Atlantic coastal gillnet fishery. The management units affected by this fishery are the northern migratory, northern North Carolina, and southern North Carolina management units. An estimated 6 (CV= 0.89) mortalities occurred annually in the shark drift gillnet fishery off the coast of Florida during 1999-2002, affecting the Central Florida management unit. No observer data are available for other fisheries that may interact with WNA coastal bottlenose dolphins. Therefore, the total average annual mortality estimate is considered to be a lower bound of the actual annual human-caused mortality for each stock.

Fishery Information

Bottlenose dolphins interact with commercial fisheries and occasionally are taken in fishing gear including gillnets, seines, long-lines, shrimp trawls, and crab pots (Read 1994; Wang ~~et al.~~*et al.* 1994) in near-shore areas where dolphin density and fishery effort are greatest. There are nine Category II commercial fisheries that interact with WNA coastal bottlenose dolphins in the 2003 MMPA List Of Fisheries (LOF), six of which occur in North Carolina waters. Category II fisheries include the mid-Atlantic coastal gillnet, NC inshore gillnet, mid-Atlantic haul/beach seine, NC long haul seine, NC stop net, Atlantic blue crab trap/pot, Southeast Atlantic gillnet, Southeastern U.S. Atlantic shark gillnet and the Virginia pound net (see 2003 List of Fisheries, 68 FR 41725, July 15 2003). The mid-Atlantic haul/beach seine fishery also includes the haul seine and swipe net fisheries. The term mid-Atlantic refers to the geographic area south of Long Island, landward to 72° 30' W longitude, and north of the line extending due east from the North Carolina/South Carolina border (66 FR 6545, January 22 2001).

There are five Category III fisheries that may interact with WNA coastal bottlenose dolphins. Three of these are inshore gillnet fisheries: the Delaware Bay inshore gillnet, the Long Island Sound inshore gillnet, and the Rhode Island, southern Massachusetts, and New York Bight inshore gillnet. The remaining two are the shrimp trawl and mid-Atlantic menhaden purse seine fisheries. There are have been no takes observed in these fisheries in recent years and no systematic observer coverage.

Mid-Atlantic ~~Coastal~~ Gillnet

This fishery has the highest documented level of mortality of WNA coastal morphotype bottlenose dolphins, and the North Carolina sink gillnet fishery is its largest component in terms of fishing effort and observed takes. Of 12 observed mortalities between 1995 and~~-~~2000, 5 occurred in sets targeting spiny or smooth dogfish and another in a set targeting "shark" species, 2 occurred in striped bass sets, 2 occurred in Spanish mackerel sets, and the remainder were in sets targeting kingfish, weakfish, or finfish generically (Rossman and Palka 2001). Only two bottlenose dolphin mortalities were observed in 2001-2002, both occurring in the winter mixed North Carolina unit. The overall estimated level of mortality has declined during the past two years associated with reductions in fishery effort~~, reduced levels of observer coverage,~~ and reduced observed bycatch ~~rates~~ (Rossman and Palka in review). Due to these significant changes in the behavior of the fishery, bycatch estimates for these fisheries are separated into two periods~~ from~~: 1996~~-~~ to 2000 and 2001~~-~~to 2002 (Table 2). The mortality estimates for the coastal gillnet fishery have not been updated for 2003 and 2004. These will be updated for the 2007 stock assessment report.

Table 2. Summary of the 1996-2002 incidental mortality of bottlenose dolphins (*Tursiops truncatus*) by management unit in the commercial mid-Atlantic coastal gillnet fisheries. Data include the years sampled (Years), the number of vessels active within the fishery (Vessels), type of data used (Data Type), observer coverage (Observer Coverage), mortalities recorded by on-board observers (Observed Mortality), estimated annual mortality (Estimated Mortality), estimated CV of the annual mortality (Estimated CVs), and mean annual mortality (CV in parentheses).

Seasonal Management Unit	Years	Vessels	Data Type[a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Mortality[d]	Estimated CVs[c]	Mean Annual Mortality
Summer Northern Migratory	1996-2000	NA	Obs. Data, NER Dealer Data	.05, .03, .02, .03, .03,	0, 0, 0, 0, 0	0, 0, 1, 1, 1,	33, 30, 37, 19, 30,	0.48, 0.48, 0.48, 0.48, 0.48	30 (0.22)

	2001-2002			.02, .01	0, 0	0, 0	11, 11	0.35, 0.35	11 (0.25)
Summer Northern NC	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.01, .00, <.01, .01, .03,	0, 0, 0, 0, 0	1, 0, 0, 0, 0,	27, 33, 17, 13, 26,	0.61, 0.61, 0.61, 0.61, 0.61	23 (0.29)
	2001-2002			.01, <.01	0, 0	0, 0	8, 8	1.06, 1.06	8 (0.75)
Summer Southern NC	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.00, .00, .01, .03, .03,	0, 0, 0, 0, 0	0, 0, 0, 0, 0	0, 0, 0, 0, 0	NA	0 (NA)
	2001-2002			.02, <.01	0, 0	0, 0	0, 0	NA	0 (NA)
Winter NC mixed	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.01, .01, .02, .02, .02,	0, 0, 0, 0, 0	1, 0, 1, 2, 2,	173, 211, 175, 196, 146,	0.46, 0.46, 0.46, 0.46, 0.46	180 (0.21)
	2001-2002			.01, .01	0, 0	0, 2	67, 50	0.45, 0.45	58 (0.32)
Total	2001-2002 Only								77 (0.26)

NA=Not Available

a Observer data (Obs. data) are used to measure bycatch rates; the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. The NEFSC collects weighout landings data that are used as a measure of total effort for the sink gillnet fisheries.

b The observer coverage for the mid-Atlantic coastal sink gillnet fishery is measured as a proportion of the tons of fish landed.

c. The annual estimates of mortality from 1998-2000 were generated by applying one bycatch rate per management unit as estimated by a generalized linear model (Palka and Rossman 2001). The CV does not account for variability that may exist in the unit of total landings (mt) from each year that are used to expand the bycatch rate. Therefore, the CV is the same for all five annual estimates.

d. The annual estimates of mortality from 2001-2002 were generated by applying the same method used in Palka and Rossman (2001). An new factor variable was added to the model to separate the time series of historical data (1996-2000) from data collected during the recent time period (2001-2002) (Rossman and Palka in review).

South Atlantic Shark Drift Gillnet

Observed takes of bottlenose dolphins occurred primarily during winter months when the fishery operates in waters off of southern Florida. Fishery observer coverage outside of this time and area has increased significantly in the last 2 years, and there was one observed mortality during summer months in fishing operations off ~~of~~ Cape Canaveral, FL. All observed fishery takes are restricted to the Central Florida management unit of coastal bottlenose dolphin. Total bycatch mortality has been estimated for ~~1999-2002~~2000-2004 following methods described in (Garrison 2003, Table 3).

Table 3. Summary of the ~~1999-2002~~2000-2004 incidental mortality of bottlenose dolphins (*Tursiops truncatus*) by management unit in the driftnet fishery in federal waters off the coast of Florida. Data include years sampled (Years), number of vessels active within the fishery (Vessels), type of data used (Data Type), annual observer coverage (Observer Coverage), mortalities recorded by on-board observers (Observed Mortality), estimated annual mortality (Estimated Mortality), estimated CV of the annual mortality (Estimated CVs), and mean annual mortality (CV in parentheses).

Seasonal Management Unit	Years	Vessels	Data Type [a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northern Florida	~~1999-2002~~2000-2004	6	Obs. Data, SEFSC FVL	~~0.29,~~ 0.23, 0.07, 0.20, 0.05, 0.10	0, 0, 0, 0,0	0, 0,0,0,0	0, 0, 0, 0, 0	NA	0
Central Florida	~~1999-2002~~2000-2004	6	Obs. Data, SEFSC FVL	~~0.09,~~ 0.15, 0.42, 0.25, 0.09, 0.19	0, 0, 0, 0,0	~~4,~~ 1, 4, 1,2,0	~~12,~~ 2, 4, 7, 13, 0	~~0.78,~~ 1, 0, 1, .81, NA	~~6~~ 5 (0.~~89~~49)

a. Observer data are used to estimate bycatch rates. The SEFSC Fishing Vessel Logbook (FVL) is used to estimate effort as total number of vessel trips per bottlenose dolphin management unit.

b. Observer coverage in the central Florida management unit ~~is largely restricted to~~approaches 100% during the period between January - March south of 27° 51' N latitude.

Beach Haul Seine

~~A total of 2~~Two coastal bottlenose dolphin takes were observed in the mid-Atlantic beach haul seine fishery: 1 in May 1998 and 1 in December 2000.

Crab Pots

Between 1994 and 1998, 22 bottlenose dolphin carcasses (4.4 dolphins per year on average) recovered by the Stranding Network between North Carolina and Florida's Atlantic coast displayed evidence of possible interaction with a trap/pot fishery (i.e., rope and/or pots attached, or rope marks). Additionally, at least 5 dolphins were reported to be released alive (condition unknown) from blue crab traps/pots during this time period. During 2003, two bottlenose dolphins were observed entangled in crab pot lines in South Carolina.

Virginia Pound Nets

Stranding data for 1993-1997 document interactions between WNA coastal bottlenose dolphins and pound nets in Virginia. Two bottlenose dolphin carcasses were found entangled in the leads of pound nets in Virginia during 1993-1997, an average of 0.4 bottlenose dolphin strandings per year. A third record of an entangled bottlenose dolphin in Virginia in 1997 may have been associated with this fishery. This entanglement involved a bottlenose dolphin carcass found near a pound net with twisted line marks consistent with the twine in the nearby pound net lead rather than with monofilament gillnet gear.

Shrimp Trawl

One bottlenose dolphin was recovered dead from a shrimp trawl in Georgia in 1995 (Southeast USA Marine Mammal Stranding Network unpublished data), and another was taken in 1996 near the mouth of Winyah Bay, SC, during a research survey. No other bottlenose dolphin mortality or serious injury has been reported to NMFS. There has been very little systematic observer coverage of this fishery during the last decade.

Menhaden Purse Seine

The Atlantic menhaden purse seine fishery historically reported an annual incidental take of 1 to 5 bottlenose dolphins (NMFS 1991, pp. 5-73). However, no observer data are available, and this information has not been updated for some time.

Other Mortality

From 1997~~-~~to ~~2000~~2001, 1,~~382~~ 654 bottlenose dolphins were reported stranded along the Atlantic coast from New York to Florida (Hohn and Martone 2001; Hohn ~~et al.~~*et al.* 2001; Palka ~~et al.~~*et al.* 2001b, Northeast Regional

Stranding Program, Southeast Regional Stranding Program). Between ~~2001~~2002 and ~~2003~~ 2004, ~~977~~ 963 bottlenose dolphins stranded along the Atlantic coast from New York to Florida (Table 4). Of these, it was possible to determine whether or not a human interaction had occurred for ~~459~~ 487 (~~47~~51%); for the remainder it was not possible to make that determination. Of those cases where a cause could be determined, ~~37~~32% of the carcasses were determined to have been involved in a ~~human interaction coastwide, and the majority of these were classified as~~ fisheries interaction~~s~~. However, this proportion ranged widely and was highest for Virginia (~~71~~60%) and North Carolina (~~43~~40%). Stranded carcasses are not routinely identified to either the offshore or coastal morphotype of bottlenose dolphin, therefore it is possible that some of the reported strandings were of the offshore form.

The nearshore habitat occupied by the coastal morphotype is adjacent to areas of high human population and in the northern portion of its range is highly industrialized. The blubber of stranded dolphins examined during the 1987-88 mortality event contained anthropogenic contaminants in levels among the highest recorded for a cetacean (Geraci 1989). There are no estimates of indirect human-caused mortality resulting from pollution or habitat degradation.

Table 4. Summary of bottlenose dolphins stranded along the Atlantic Coast of the US. Total Stranded is further stratified into carcasses with signs of human interaction, those without any signs, and those where human interaction could not be determined (CBD). Human Interaction is stratified into stranded animals with line or nets marks or gear attached (Fishery Interaction~~), cleanly removed (cut off) appendages or cuts on the body (Mutilation),~~), and other indications of human interactions such as propellor wounds, mutilation, or gunshot wounds. Florida strandings include only the Atlantic coast of Florida extending to Key West.

STATE	**~~2001~~2002**	**~~2002~~2003**	**~~2003~~2004**	**STATE**	**~~2001~~2002**	**~~2002~~2003**	**~~2003~~2004**
New York Total Stranded	**~~1~~1**	**~~1~~2**	**0~~2~~**	**N. Carolina** Total Stranded	**94~~87~~**	**69~~94~~**	**88 ~~69~~**
Human Interaction				Human Interaction			
---- Fishery Interaction	0	0	0~~0~~	---- Fishery Interaction	13~~9~~	11~~13~~	15~~11~~
~~---- Mutilation~~	~~0~~	~~0~~	~~0~~	~~---- Mutilation~~	~~0~~	~~2~~	~~0~~
---- Other	0	0	~~0~~0	---- Other	2~~0~~	0 ~~2~~	1 ~~0~~
No Human Interaction	0	~~0~~1	0~~1~~	No Human Interaction	15 ~~16~~	16 ~~15~~	22 ~~16~~
CBD	1	1	0~~1~~	CBD	62~~62~~	42~~62~~	50 ~~42~~
New Jersey Total Stranded	**11**	**~~11~~7**	**15~~7~~**	**S. Carolina** Total Stranded	**28~~69~~**	**35~~28~~**	**46~~35~~**
Human Interaction				Human Interaction			
---- Fishery Interaction	1~~1~~	1~~1~~	1~~1~~	---- Fishery Interaction	4~~3~~	3~~4~~	3 ~~3~~
~~---- Mutilation~~	~~0~~	~~0~~	~~0~~	~~---- Mutilation~~	~~0~~	~~0~~	~~0~~
---- Other	1~~0~~	0 ~~1~~	1~~0~~	---- Other	0~~3~~	0~~0~~	3 ~~0~~
No Human Interaction	4~~7~~	5~~4~~	11~~5~~	No Human Interaction	13~~23~~	17~~13~~	22 ~~17~~
CBD	5~~3~~	1~~5~~	2~~1~~	CBD	11~~40~~	15 ~~11~~	18 ~~15~~
Delaware Total Stranded	**~~6~~13**	**~~13~~18**	16~~18~~	**Georgia** Total Stranded	**11~~23~~**	**17~~11~~**	**27~~17~~**
Human Interaction				Human Interaction			
---- Fishery Interaction	1~~0~~	1 ~~1~~	1~~1~~	---- Fishery Interaction	0~~1~~	0 ~~0~~	3~~0~~
~~---- Mutilation~~	~~0~~	~~0~~	~~0~~	~~---- Mutilation~~	~~0~~	~~0~~	~~0~~
---- Other	0~~0~~	0~~0~~	0~~0~~	---- Other	0~~1~~	0~~0~~	1~~0~~
No Human Interaction	8~~3~~	13~~8~~	11~~13~~	No Human Interaction	0~~5~~	2~~0~~	9~~2~~
CBD	4~~3~~	4~~4~~	4~~4~~	CBD	11 ~~16~~	15~~11~~	14~~15~~
Maryland Total Stranded	**5~~3~~**	**10~~5~~**	**10 ~~10~~**	**Florida** Total Stranded	**82~~101~~**	**74~~82~~**	**81~~74~~**
Human Interaction				Human Interaction			
---- Fishery Interaction	0~~0~~	1~~0~~	1 ~~1~~	---- Fishery Interaction	8~~9~~	11~~8~~	7~~11~~
~~---- Mutilation~~	~~0~~	~~0~~	~~0~~	~~---- Mutilation~~	~~0~~	~~0~~	~~0~~

---- Other	0~~0~~	0~~0~~	0~~0~~
No Human Interaction	2~~1~~	8~~2~~	6~~8~~
CBD	3~~2~~	1~~3~~	3~~1~~
Virginia Total Stranded	**68~~71~~**	**60~~68~~**	**75~~60~~**
Human Interaction			
---- Fishery Interaction	15~~17~~	25~~15~~	22~~25~~
~~---- Mutilation~~	~~1~~	~~2~~	~~0~~
---- Other	6~~1~~	0~~4~~	2~~0~~
No Human Interaction	7~~8~~	12~~7~~	13~~12~~
CBD	39~~44~~	23~~39~~	38~~23~~

---- Other	2~~1~~	0~~2~~	2~~0~~
No Human Interaction	50~~46~~	21~~50~~	27~~21~~
CBD	22~~45~~	42~~22~~	45~~42~~
Total	**313~~372~~**	**292~~313~~**	**358~~292~~**

STATUS OF STOCKS

The coastal migratory stock was designated as depleted under the MMPA. From 1995~~-~~ to 2001, NMFS recognized only a single migratory stock of coastal bottlenose dolphins in the WNA, and the entire stock was listed as depleted. The management units in this report now replace the single coastal migratory stock. A re-analysis of the depletion designation on a management unit basis needs to be undertaken. In the interim, because one or more of the management units may be depleted, all management units retain the depleted designation. In addition, mortality exceeded PBR in the North Carolina winter mixed stocks during the period from 1996 to~~-~~2000 (Table 1). The total fishery-related mortality and serious injury for most stocks is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate.
The species is not listed as threatened or endangered under the Endangered Species Act, but the management units are strategic stocks due to the depleted listing under the MMPA.

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HARBOR PORPOISE (*Phocoena phocoena)*: Gulf of Maine/Bay of Fundy Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

This stock is found in U.S. and Canadian Atlantic waters. The distribution of harbor porpoises has been documented by sighting surveys, strandings and takes reported by NMFS observers in the Sea Sampling Program. During summer (July to September), harbor porpoises are concentrated in the northern Gulf of Maine and southern Bay of Fundy region, generally in waters less than 150 m deep (Gaskin 1977; Kraus *et al.* 1983; Palka 1995a, b), with a few sightings in the upper Bay of Fundy and on the northern edge of Georges Bank (Palka 2000). During fall (October-December) and spring (April-June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south. They are seen from the coastline to deep waters (>1800 m; Westgate *et al.* 1998), although the majority of the population is found over the continental shelf. During winter (January to March), intermediate densities of harbor porpoises can be found in waters off New Jersey to North Carolina, and lower densities are found in waters off New York to New Brunswick, Canada. There does not appear to be a temporally coordinated migration or a specific migratory route to and from the Bay of Fundy region. However, during the fall, several satellite tagged harbor porpoises did favor the waters around the 92 m isobath, which is consistent with observations of high rates of incidental catches in this depth range (Read and Westgate 1997). There were two stranding records from Florida during the 1980's (Smithsonian strandings database) and one during 2003 (NE Regional Office/NMFS strandings and entanglement database).

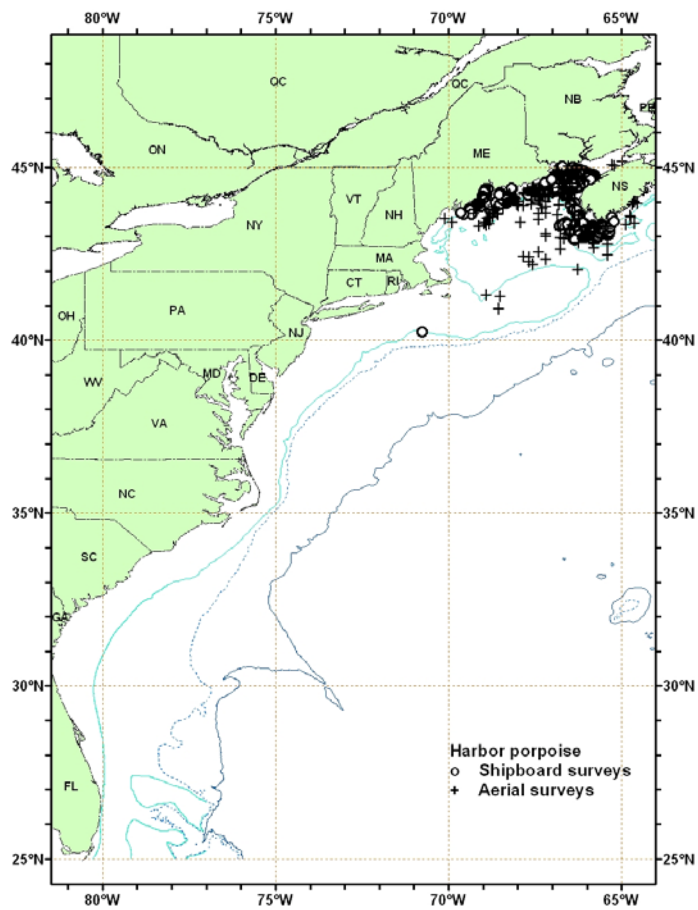

Figure 1. *Distribution of harbor porpoises from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1998, 1999, and 2004. Isobaths are the 100m, 1000m, and 4000m depth contours.*

Gaskin (1984, 1992) proposed that there were four separate populations in the western North Atlantic: the Gulf of Maine/Bay of Fundy, Gulf of St. Lawrence, Newfoundland and Greenland populations. Recent analyses involving mtDNA (Wang *et al.* 1996; Rosel *et al.* 1999a, 1999b), organochlorine contaminants (Westgate *et al.*1997; Westgate and Tolley 1999), heavy metals (Johnston 1995), and life history parameters (Read and Hohn 1995) support Gaskin's proposal. Genetic studies using mitochondrial DNA (Rosel *et al.* 1999a) and contaminant studies using total PCBs (Westgate and Tolley 1999) indicate that the Gulf of Maine/Bay of Fundy females were distinct from females from the other populations in the Northwest Atlantic. Gulf of Maine/Bay of Fundy males were distinct from Newfoundland and Greenland males, but not from Gulf of St. Lawrence males according to studies comparing mtDNA (Rosel *et al.* 1999a; Palka *et al.* 1996) and CHLORs, DDTs, PCBs and CHBs (Westgate and Tolley 1999). Analyses of stranded animals from the mid-Atlantic states suggest that this aggregation of harbor porpoises consists of animals from more than just the Gulf of Maine/Bay of Fundy stock (Rosel *et al.* 1999a). However, the majority of the samples used in the Rosel *et al.* (1999a) study were from stranded juvenile animals. Further work is needed to examine adult animals from this region. Nuclear microsatellite markers have also been applied to samples from these four populations, but this analysis failed to detect significant population sub-division in either sex (Rosel *et al.* 1999a). These patterns may be indicative of female philopatry coupled with dispersal of males. This report follows Gaskin's hypothesis on harbor porpoise stock structure in the western North Atlantic, where the Gulf of Maine and Bay of Fundy harbor porpoises are recognized as a single management stock separate from harbor porpoise populations in the Gulf of St. Lawrence, Newfoundland and Greenland.

POPULATION SIZE

To estimate the population size of harbor porpoises in the Gulf of Maine/Bay of Fundy region, four line-transect sighting surveys were conducted during the summers of 1991, 1992, 1995 and 1999 (Table 1; Figure 1). The estimates were 37,500 harbor porpoises in 1991 (CV=0.29, 95% confidence interval (CI)=26,700-86,400) (Palka 1995a), 67,500 harbor porpoises in 1992 (CV=0.23, 95% CI=32,900-104,600), 74,000 harbor porpoises in 1995 (CV=0.20, 95% CI=40,900-109,100) (Palka 1996) and 89,700 in 1999 (CV=0.22, 95% CI=53,400-150,900) (Palka 2000). The inverse variance weighted-average abundance estimate (Smith *et al.* 1993) of the 1991 to 1995 estimates was 54,300 harbor porpoises (CV=0.14, 95% CI=41,300-71,400). Possible reasons for inter-annual differences in abundance and distribution include experimental error, inter-annual changes in water temperature and availability of primary prey species (Palka 1995b), and movement among population units (e.g., between the Gulf of Maine and Gulf of St. Lawrence). One of the reasons the 1999 estimate is larger than previous estimates is that, for the first time, the upper Bay of Fundy and northern Georges Bank were surveyed and harbor porpoises were seen in both areas. This indicates the harbor porpoise summer habitat is larger than previously thought (Palka 2000).

The shipboard sighting survey procedure used in all four surveys involved two independent teams on one ship that searched using the naked eye in non-closing mode. Abundance, corrected for *g(0)*, the probability of detecting an animal group on the track line, was estimated using the direct-duplicate method (Palka 1995a) and variability was estimated using bootstrap re-sampling methods. Potential biases not explicitly accounted for include ship avoidance and submergence time. The effects of these two potential biases are unknown. During 1995 and 1999 a section of the region was surveyed by airplane while the rest of the region was surveyed by ship, as in previous years (Palka 1996; 2000). During 1995, in addition to the Gulf of Maine/Bay of Fundy area, waters from Virginia to the mouth of the Gulf of St. Lawrence were surveyed and harbor porpoises were seen only in the vicinity of the Gulf of Maine/Bay of Fundy. During 1999, waters from south of Cape Cod to the mouth of the Gulf of St. Lawrence were surveyed (Palka 2000).

The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is 89,700 (CV=0.22), based on the 1999 survey results not averaged with other years (Table 1). This is because the 1999 estimate is the most current, and this survey discovered portions of the harbor porpoise range not covered previously.

Kingsley and Reeves (1998) estimated there were 12,100 (CV=0.26) harbor porpoises in the entire Gulf of St. Lawrence during 1995, and 21,700 (CV=0.38) in the northern Gulf of St. Lawrence during 1996. These estimates are presumed to be of the Gulf of St. Lawrence stock of harbor porpoises. The highest densities were north of Anticosti Island, with lower densities in the central and southern Gulf. During the 1995 survey, 8,427km of track lines were flown in an area of 221,949 km^2 during August and September. During the 1996 survey, 3,993km of track lines were flown in an area of 94,665 km^2 during July and August. Data were analyzed using Quenouille's jackknife bias reduction procedure on line transect methods that modeled the left truncated sighting curve. These estimates were not corrected for visibility biases such as *g(0)*.

Table 1. Summary of recent abundance estimates for the Gulf of Maine/Bay of Fundy harbor porpoise. Month, year, and area covered during each abundance survey and the resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Aug 1999	S. Gulf of Maine to upper Bay of Fundy	89,700	0.22

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for harbor porpoises is 89,700 (CV=0.22). The minimum population estimate for the Gulf of Maine/Bay of Fundy harbor porpoise is 74,695.

Current Population Trend

Previous abundance estimates for harbor porpoises in the Gulf of Maine/Bay of Fundy are available from earlier studies, (e.g., 4,000 animals (Gaskin 1977), and 15,800 animals (Kraus *et al.* 1983)). These estimates cannot be used in a trends analysis because they were for selected small regions within the entire known summer range and, in some cases, did not incorporate an estimate of *g(0)* (NEFSC 1992).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Although current population growth rates of Gulf of Maine/Bay of Fundy harbor porpoises have not been estimated due to lack of data, several attempts have been made to estimate potential population growth rates. Barlow and Boveng (1991), who used a re-scaled human life table, estimated the upper bound of the annual potential growth rate to be 9.4%. Woodley and Read (1991) used a re-scaled Himalayan tahr life table to estimate a likely annual growth rate of 4%. In an attempt to estimate a potential population growth rate that incorporates many of the uncertainties in survivorship and reproduction, Caswell *et al.* (1998) used a Monte Carlo method to calculate a probability distribution of growth rates. The median potential annual rate of increase was approximately 10%, with a 90% confidence interval of 3-15%. This analysis underscored the considerable uncertainty that exists regarding the potential rate of increase in this population. Consequently, for the purposes of this assessment, the maximum net productivity rate was assumed to be 4%, consistent with values used for other cetaceans for which direct observations of maximum rate of increase are not available, and following a recommendation from the Atlantic Scientific Review Group. The 4% value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 74,695. The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the Gulf of Maine/Bay of Fundy harbor porpoise is 747.

ANNUAL HUMAN-CAUSED MORTALITY

Data to estimate the mortality and serious injury of harbor porpoise come from U.S. and Canadian Sea Sampling Programs, from records of strandings in U.S. and Canadian waters, and from records in the Marine Mammal Authorization Program (MMAP). See Appendix III for details on U.S. fisheries and data sources. Estimates using Sea Sampling Program and MMAP data are discussed by fishery under the Fishery Information section (Table 2). Strandings records are discussed under the Unknown Fishery in the Fishery Information section (Table 3) and under the Other Mortality section (Tables 4 to 5).

~~A take reduction plan was implemented 01 January 1999 to reduce takes of harbor porpoises in U.S. Atlantic gillnet fisheries. In addition, several New England and mid-Atlantic Fishery Management Council plans that apply to parts of the gillnet fisheries were also implemented during 1999. Because these plans changed the U.S. gillnet fisheries, only mortality estimates from after 1999 are representative of the current U.S. mortality.~~

The total annual estimated average human-caused mortality is ~~576~~575~~473~~ (CV=0.17) harbor porpoises per year. This is derived from four components: ~~516~~515~~417~~ harbor porpoise per year (CV=0.17) from U.S. fisheries using observer and MMAP data, 55~~48~~ per year (unknown CV) from Canadian fisheries using observer data, 4.2~~6.8~~ per year from U.S. unknown fisheries using strandings data, and 1.2 per year from unknown human-caused mortality (mutilated stranded harbor porpoises).

Fishery Information

Recently, Gulf of Maine/Bay of Fundy harbor porpoise takes have been documented in the U.S. Northeast sink gillnet, mid-Atlantic ~~coastal~~ gillnet, and in the Canadian Bay of Fundy groundfish sink gillnet and herring weir fisheries (Table 2). Detailed U.S. fishery information are reported in Appendix III.

Earlier Interactions

One harbor porpoise was observed taken from the Atlantic pelagic drift gillnet fishery during 1991-1998; the fishery ended in 1998. This observed bycatch was notable because it occurred in continental shelf edge waters adjacent to Cape Hatteras (Read *et al.* 1996). Estimated annual fishery-related mortality (CV in parentheses) attributable to this fishery was 0.7 in 1989 (7.00), 1.7 in 1990 (2.65), 0.7 in 1991 (1.00), 0.4 in 1992 (1.00), 1.5 in 1993 (0.34), 0 during 1994-1996 and 0 in 1998. The fishery was closed during 1997.

U.S.

Northeast Sink Gillnet

In 1984 the Northeast sink gillnet fishery was investigated by a sampling program that collected information concerning marine mammal bycatch. Approximately 10% of the vessels fishing in Maine, New Hampshire, and Massachusetts were sampled. Among the 11 gillnetters who received permits and logbooks, 30 harbor porpoises were reported caught. It was estimated, using rough estimates of fishing effort, that a maximum of 600 harbor porpoises were killed annually in this fishery (Gilbert and Wynne 1985, 1987).

In 1990, an observer program was started by NMFS to investigate marine mammal takes in the Northeast sink gillnet fishery (Appendix III). There have been 501~~474~~ harbor porpoise mortalities related to this fishery observed between 1990 and 2004~~3~~ and one was released alive and uninjured. Bycatch in the northern Gulf of Maine occurs primarily from June to September, while in the southern Gulf of Maine, bycatch occurs from January to May and September to December. Estimated annual bycatch (CV in parentheses) from this fishery during 1990-2004~~3~~ was 2,900 in 1990 (0.32), 2,000 in 1991 (0.35), 1,200 in 1992 (0.21), 1,400 in 1993 (0.18) (Bravington and Bisack 1996; CUD 1994), 2,100 in 1994 (0.18), 1,400 in 1995 (0.27) (Bisack 1997), 1,200 in 1996 (0.25), 782 in 1997 (0.22), 332 in 1998 (0.46), 270 in 1999 (0.28) (Rossman and Merrick 1999), 507 in 2000 (0.37), 53 (0.97) in 2001, 444 (0.37) in 2002, ~~and~~ 592 (0.33) in 2003, and ~~659~~654 (0.3~~8~~6) in 2004. The increase in the CV in recent years is mainly due to the small number of observed takes.

In November 2001, there were two takes reported through the Marine Mammal Authorization Program (MMAP) that were taken in one sink gillnet haul located near Jeffery's Ledge. These two takes were then added to the 2 observed takes and 51 estimated total take that was derived from the observer data because the MMAP takes were in a time and area not included in any of the above observer-based bycatch estimates. This then results in 4 observed takes and 53 (0.97) total takes in 2001 from this fishery (Table 2).

There appeared to be no evidence of differential mortality in U.S. or Canadian gillnet fisheries by age or sex in animals collected before 1994, although there was substantial inter-annual variation in the age and sex composition of the bycatch (Read and Hohn 1995). Using observer data collected during 1990-1998 and a logit regression model, females were 11 times more likely to be caught in the offshore southern Gulf of Maine region, males were more likely to be caught in the south Cape Cod region, and the overall proportion of males and females caught in a gillnet and brought back to land were not significantly different from 1:1 (Lamb 2000).

Two preliminary experiments, using acoustic alarms (pingers) attached to gillnets, were conducted in the Gulf of Maine during 1992 and 1993 and took 10 and 33 harbor porpoises, respectively. During fall 1994, another controlled scientific experiment was conducted in the southern Gulf of Maine, where 25 harbor porpoises were taken in 423 strings with non-active pingers (controls) and 2 harbor porpoises were taken in 421 strings with active pingers (Kraus *et al.* 1997). In addition, 17 other harbor porpoises were taken in nets that did not follow the experimental protocol (Table 2). After 1994, experimental fisheries were conducted where all nets in a designated area were required to use pingers and only a sample of the nets were observed. During November-December 1995, an experimental fishery was conducted in the southern Gulf of Maine (Jeffreys Ledge) region, where no harbor porpoises were observed taken in 225 pingered nets. During 1995, all takes from pingered nets were added directly to the estimated total bycatch for that year. During April 1996, 3 other experimental fisheries occurred. In the Jeffreys Ledge area, in 88 observed hauls using pingered nets, 9 harbor porpoises were taken. In the Massachusetts Bay region, in 171 observed hauls using pingered nets, 2 harbor porpoises were taken. And, in a region just south of Cape Cod, in 53 observed hauls using pingered nets, no harbor porpoises were taken. During 1997, experimental fisheries were allowed in the mid-coast region during March 25 to April 25 and November 1 to December 31. During the 1997 spring experimental fishery, 180 hauls were observed with active pingers and 220 hauls were controls (silent). All observed harbor porpoise takes were in silent nets: 8 in nets with control (silent) pingers and 3 in nets without pingers. Thus, there was a statistical difference between the catch rate in nets with pingers and silent nets (Kraus and Brault 1997). During the 1997 fall experimental fishery, out of 125 observed hauls using pingered nets no harbor porpoises were taken.

From 95 stomachs of harbor porpoises collected in groundfish gillnets in the Gulf of Maine between September and December 1989-1994, Atlantic herring (*Clupea harengus*) was the most important prey. Pearlsides (*Maurolicus weitzmani*), silver hake (*Merluccius bilinearis*) and red and white hake (*Urophycis* spp.) were the next most common prey species (Gannon *et al.* 1998).

Average estimated harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery during 1994-1998, before the Take Reduction Plan, was 1,163 (0.11). ~~Because of the Take Reduction Plan to reduce takes in U.S. Atlantic gillnets, and the NEFMC fishery management plans to manage groundfish, fishing practices changed during 1999. Subsequently, t~~The average annual harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery from 2000~~1999~~ to 2004~~3~~ was ~~451~~450~~373~~ (0.18) (Table 2).

Mid-Atlantic ~~Coastal~~ Gillnet

Before an observer program was in place for this fishery, Polacheck *et al.* (1995) reported one harbor porpoise incidentally taken in shad nets in the York River, Virginia. In July 1993 an observer program was initiated in the mid-Atlantic coastal gillnet fishery by the NEFSC Sea Sampling program (Appendix III). Documented bycatch after 1995 were from December to May. Bycatch estimates were calculated using methods similar to that used for bycatch estimates in the Northeast sink gillnet fishery (Bravington and Bisack 1996; Bisack 1997). After 1998, a separate bycatch estimate was made for the drift gillnet and set gillnet sub-fisheries. The number presented here is the sum of these two sub-fisheries. The estimated annual mortality (CV in parentheses) attributed to this fishery was 103 (0.57) for 1995, 311 (0.31) for 1996, 572 (0.35) for 1997, 446 (0.36) for 1998, 53 (0.49) for 1999, 21 (0.76) for 2000, 26 (0.95) for 2001, unknown in 2002, ~~and~~ 76 (1.13) in 2003, and 137 (0.91) in 2004. During 2002, the overall observer coverage was lower than usual, 1%, where 65% of that coverage was off of Virginia, and most of the rest of the area was not sampled at all. Thus, due to this non-representative and low observer coverage, a bycatch estimate for harbor porpoises cannot be confidently estimated. Annual average estimated harbor porpoise mortality and serious injury from the mid-Atlantic coastal gillnet fishery during 1995 to 1998, before the Take Reduction Plan, was 358 (CV=0.20). ~~Because of the Take Reduction Plan to reduce takes in U.S. Atlantic gillnets, and the fishery management plans to manage groundfish, fishing practices changed during 1999. Subsequently, t~~The average annual harbor porpoise mortality and serious injury in the mid-Atlantic coastal gillnet fishery from 2000~~1999~~ to 2004~~3~~ was 65~~44~~ (0.49~~0.61~~), which is the 4-year average estimate from ~~1999,~~ 2000, 2001, ~~and~~ 2003, and 2004.

Unknown Fishery

The strandings and entanglement database, maintained by the New England Aquarium and the Northeast Regional Office/NMFS, reported 228, 27, 113, 79, ~~and~~ 122, and 118 stranded harbor porpoises on U.S. beaches during 1999 to 2004~~3~~, respectively (see Other Mortality section for more details). Of these, it was determined that the cause of death of 19, 1, 3, 2, ~~and~~ 9, and 6 stranded harbor porpoises in 1999 to 2004~~3~~, respectively, were due to unknown fisheries (Table~~s 3 and~~ 5) and these animals were in areas and times that were not included in the above mortality estimate derived from observer program data. The average harbor porpoise mortality and serious injury in this unknown fishery category from 2000~~1999~~ to 2004~~3~~ is 4.2~~6.8~~ (CV is unknown).

North ~~Atlantic~~east Bottom Trawl

This fishery is active in New England waters in all seasons. Two harbor porpoise mortalities were observed in the North Atlantic bottom trawl fishery between 1989 and 2004~~3~~. The first take occurred in February 1992 east of Barnegat Inlet, New Jersey at the continental shelf break. The animal was clearly dead prior to being taken by the trawl, because it was severely decomposed and the tow duration of 3.3 hours was insufficient to allow extensive decomposition. The second take occurred in January 2001 off New Hampshire in a haul trawling for flounder. This animal was clearly dead prior to being taken by the trawl, because it was severely decomposed (the skull broke off while the net was emptying) and the tow duration was 3.1 hours. This take was observed in the same time and area stratum that had documented gillnet takes. In conclusion, the estimated bycatch of harbor porpoises due to this fishery is 0.

CANADA

Hooker *et al.* (1997) summarized bycatch data from a Canadian fisheries observer program that placed observers on all foreign fishing vessels operating in Canadian waters, on 25-40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. No harbor porpoises were observed taken.

Bay of Fundy Sink Gillnet

During the early 1980's, Canadian harbor porpoise bycatch in the Bay of Fundy sink gillnet fishery, based on casual observations and discussions with fishermen, was thought to be low. The estimated harbor porpoise bycatch in 1986 was 94-116 and in 1989 it was 130 (Trippel *et al.* 1996). The Canadian gillnet fishery occurs mostly in the western portion of the Bay of Fundy during the summer and early autumn months, when the density of harbor porpoises is highest. Polacheck (1989) reported there were 19 gillnetters active in 1986, 28 active in 1987, and 21 in 1988.

More recently, an observer program implemented in the summer of 1993 provided a total bycatch estimate of 424 harbor porpoises (± 1 SE: 200-648) from 62 observed trips, (approximately 11.3% coverage of the Bay of Fundy trips) (Trippel *et al.* 1996). During 1994, the observer program was expanded to cover 49% of the gillnet trips (171 observed trips). The bycatch was estimated to be 101 harbor porpoises (95% confidence limit: 80-122), and the fishing fleet consisted of 28 vessels (Trippel *et al.* 1996). During 1995, due to groundfish quotas being exceeded, the gillnet fishery was closed from July 21 to August 31. During the open fishing period of 1995, 89% of the trips were observed, all in the Swallowtail region. Approximately 30% of these observed trips used pingered nets. The estimated bycatch was 87 harbor porpoises (Trippel *et al.* 1996). No confidence interval was computed due to lack of coverage in the Wolves fishing grounds. During 1996, the Canadian gillnet fishery was closed during July 20-31 and August 16-31 due to groundfish quotas. From the 107 monitored trips, the bycatch in 1996 was estimated to be 20 harbor porpoises (Trippel *et al.* 1999; DFO 1998). Trippel *et al.* (1999) estimated that during 1996, gillnets equipped with acoustic alarms reduced harbor porpoise bycatch rates by 68% over nets without alarms in the Swallowtail area of the lower Bay of Fundy. During 1997, the fishery was closed to the majority of the gillnet fleet during July 18-31 and August 16-31, due to groundfish quotas. In addition a time-area closure to reduce porpoise bycatch in the Swallowtail area occurred during September 1-7. From the 75 monitored trips, 19 harbor porpoises were observed taken. After accounting for total fishing effort, the estimated bycatch in 1997 was 43 animals (DFO 1998). Trippel *et al.* (1999) estimated that during 1997, gillnets equipped with acoustic alarms reduced harbor porpoise bycatch rates by 85% over nets without alarms in the Swallowtail area of the lower Bay of Fundy. The number of monitored trips (and observed harbor porpoise mortalities were 111 (5) for 1998, 93 (3) for 1999, 194 (5) for 2000, and 285 (39) for 2001. The estimated annual mortality estimates were 38 for 1998, 32 for 1999, 28 for 2000, and 73 for 2001 (Trippel and Shepard, 2001). Estimates of variance are not available.

There was no observer program during the summers of 2002 to~~and~~ 2004~~3~~ in the Bay of Fundy region, but the fishery was active. Thus, it is not known what the bycatch for these~~ two~~ years is. The two~~three~~-year average estimated harbor porpoise mortality in the Canadian groundfish sink gillnet fishery during 2000~~1999~~-2001 was 51~~44~~ (Table 2). An estimate of variance is not possible.

Herring Weirs

Harbor porpoises are taken in Canadian herring weirs, but there have been no recent efforts to observe takes in the U.S. component of this fishery. Smith *et al.* (1983) estimated that in the 1980's approximately 70 harbor porpoises became trapped annually and, on average, 27 died annually. In 1990, at least 43 harbor porpoises were trapped in Bay of Fundy weirs (Read 1994). In 1993, after a cooperative program between fishermen and Canadian biologists was initiated, over 100 harbor porpoises were released alive (Read 1994). Between 1992 and 1994, this cooperative program resulted in the live release of 206 of 263 harbor porpoises caught in herring weirs. Mortalities (and releases) were 11 (and 50) in 1992, 33 (and 113) in 1993, and 13 (and 43) in 1994 (Neimanis *et al.* 1995). Since that time, an additional 623 harbor porpoises have been documented in Canadian herring weirs, of which 637~~584~~ were released or escaped, 36~~2~~ died, and ~~7 ~~9 had an unknown status. Mortalities (and releases and unknowns) were 5 (and 60) in 1995; 2 (and 4) in 1996; 2 (and 24) in 1997; 2 (and 26) in 1998; 3 (and 89) in 1999; 0 (and 13) in 2000 (A. Read, pers. comm), 14 (and 296) in 2001, 3 (and 46 and 4) in 2002,~~ and~~ 1 (and 26 and 3) in 2003, and 4 (and 53 and 2) (Neimanis *et al.* 2004; H. Koopman and A. Westgate, pers. comm.).

Clinical hematology values were obtained from 29 harbor porpoises released from Bay of Fundy herring weirs (Koopman *et al.* 1999). These data represent a baseline for free-ranging harbor porpoises that can be used as a reference for long-term monitoring of the health of this population, a mandate by the MMPA. Blood for both hematology and serum chemistry, including stress and reproductive hormones, is currently being collected; with 57 samples from 2001, 15 from 2002, ~~and ~~7 from 2003, and 24 from 2004 (A. Westgate and H. Koopman, pers. comm).

Average estimated harbor porpoise mortality in the Canadian herring weir fishery during 2000~~1999~~-2004~~3~~ was 4.4~~2~~ (Table 2). An estimate of variance is not possible.

Gulf of St. Lawrence gillnet

This fishery interacts with the Gulf of St. Lawrence harbor porpoise stock, not the Gulf of Maine/Bay of Fundy harbor porpoise stock. Using questionnaires to fishermen, Lesage *et al.* (2003) determined a total of 2180 (95% CI 1012-3802) and 2478 (95% CI 1591-3464) harbor porpoises were taken in 2000 and 2001, respectively. The largest takes were in July and August around Miscou and the North Shore of the Gulf of St. Lawrence. According to the returned questionnaires, the fish species most usually associated with incidental takes of harbor porpoises include Atlantic cod, herring and mackerel. An at-sea observer program was also conducted during 2001 and 2002. However, due to low observer coverage that was not representative of the fishing effort, Lesage *et al.* (2003) concluded that resulting bycatch estimates were unreliable.

Newfoundland gillnet

This fishery interacts with the Newfoundland harbor porpoise stock, not the Gulf of Maine/Bay of Fundy harbor porpoise stock. Estimates of incidental catch of harbor porpoises are currently being calculated for 2001-2003 for the Newfoundland nearshore cod and Greenland halibut fisheries, and the Newfoundland offshore fisheries in lumpfish, herring, white hake, monkfish and skate (pers. comm. J. Lawson, DFO).

Table 2. From observer program data, summary of the incidental mortality of harbor porpoise (*Phocoena phocoena*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [a]	Observer Coverage [b]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
U.S.								
Northeast Sink Gillnet	~~99-03~~ 00-04	NA	Obs. Data, Weighout, Trip Logbook	~~.06,~~ .06, .04, .02 .03, .06	~~14[3],~~ 15[c], 4[c,f], 10[c], 12[c], 27[c]	~~270[3],~~ 507[c], 53[c,f], 444[c], 592[3], ~~659~~654[c]	~~.28,~~ .37, .97, .37, .33, ~~.38~~.36	~~451~~450~~373~~ (0.18)
Mid-Atlantic ~~Coastal~~ Gillnet	99-03 00-04	NA	Obs. Data Weighout	~~.02,~~ .02, .02, .01, .01, .02	~~3,~~ 1, 1,unk[g], 1, 2	~~53,~~ 21, 26, unk[g], 76, 137	~~.49,~~ .76, .95, unk[g], 1.13, .91	65~~44~~[g] (0.49~~61~~)
U.S. TOTAL	2000-2004~~1999-2003~~							51~~6~~5~~417~~ (0.17)
CANADA								
Groundfish Sink Gillnet	~~99-03~~ 00-04	NA	Can. Trips	~~11,~~ .41, .56, 0[h],0[h], 0[h]	~~3,~~ 5, 39, unk[h], unk[h], unk[h]	~~32,~~ 28, 73, unk[h], unk[h], ~~—~~unk[h]	NA	51~~44~~ (NA)
Herring Weir	~~99-03~~ 00-04	1998=255 licenses[d] 2002=22[e]	Coop. Data	NA	~~3,~~ 0, 14, 3, 1, 4	~~3,~~ 0, 14, 3, 1, ~~—~~ 4	NA	4.4~~2~~ (NA)
CANADIAN TOTAL	2000-2004~~1999 - 2003~~							55~~48~~ (NA)
GRAND TOTAL								~~571465~~570 (NA)

NA = Not available.

a. Observer data (Obs. Data) are used to measure bycatch rates; the U.S. data are collected by the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program, the Canadian data are collected by DFO. NEFSC collects Weighout (Weighout) landings data that are used as a measure of total effort for the U.S. gillnet fisheries. The Canadian DFO catch and effort statistical system collected the total number of trips fished by the Canadians (Can. Trips), which was the measure of total effort for the Canadian groundfish gillnet fishery.

Mandatory vessel trip report (VTR) (Trip Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast sink gillnet fishery. Observed mortalities from herring weirs are collected by a cooperative program between fishermen and Canadian biologists (Coop. Data). b. The observer coverages for the U.S. and Canadian sink gillnet fisheries are measured in trips, and for the mid-Atlantic coastal gillnet fishery, the unit of effort is tons of fish landed. c. During 2000, a harbor porpoise was taken on a non-pingered string within a stratum that did not require pingers but that stratum had other trips where strings with pingers were observed; and during 1999-2004~~2~~, harbor porpoises were taken on pingered strings within strata that required pingers but that stratum also had observed strings without pingers. For estimates made during 1998 and after, a weighted bycatch rate was applied to effort from both pingered and non-pingered hauls within a stratum. The weighted bycatch rate was: $\sum_i^{ping,non-ping} \frac{\# porpoise_i}{sslandings_i} \cdot \frac{\# hauls_i}{total \# hauls}$ There were 10, 33, 44, 0, 11, 0, 2, 8, 6, 2, 26, ~~and~~ 2, and 4 observed harbor porpoise takes on pinger trips from 1992 to 2004~~3~~, respectively, that were included in the observed mortality column. In addition, there were 9, 0, 2, 1,1, 4, 0, 1, ~~and~~ 7, and 21 observed harbor porpoise takes in 1995 to 2004~~3~~, respectively, on trips dedicated to fish sampling versus dedicated to watching for marine mammals; these were also included in the observed mortality column (Bisack 1997). d. There were 255 licenses for herring weirs in the Canadian Bay of Fundy region. e. There were 22 active weirs around Grand Manan. The number of weirs elsewhere is unknown. f. During 2001 in the U.S. Northeast sink gillnet fishery, there were 2 takes observed in the NEFSC observer program, this resulted in an estimate of 51 total bycaught harbor porpoises. In November 2001, there were two takes reported through the Marine Mammal Authorization Program that were from one sink gillnet haul that was located near Jeffery's Ledge. These two takes were then added to the 2 observed takes and 51 estimated total take derived from the observer data, resulting in 4 observed takes and 53 total takes for the fishery during 2001. g. Sixty-five percent of sampling by the NEFSC fisheries observer program was concentrated in one area off the coast of Virginia. Coverage in other areas of the mid-Atlantic was <1%. Because of the low level of sampling that was not distributed proportionally throughout the mid-Atlantic region, the observed mortality is considered unknown in 2002. The four-year average (2000~~1999~~-2001 and 2003-2004) estimated mortality was applied as the best representative estimate. h. The Canadian gillnet fishery was not observed during 2002 to~~and~~ 2004~~3~~, but the fishery was active; thus, the bycatch estimate is unknown. The average bycatch for this fishery is from the two~~three~~ preceding years, 2000~~1999~~ to 2001.

Table 3. From strandings and entanglement data, summary of confirmed incidental mortality of harbor porpoises (*Phocoena phocoena*) by fishery: includes years sampled (Years), number of vessels active within the fishery (Vessels), type of data used (Data Type), mortalities assigned to this fishery (Assigned Mortality), and mean annual mortality.

Fishery	Years	Vessels	Data Type [a]	Assigned Mortality	Mean Annual Mortality
Unknown gillnet fishery	~~99-03~~00-04	NA	Entanglement & Strandings	~~19,~~ 1, 3, 2, 9, 6	4.2~~6.8~~
TOTAL					4.2~~6.8~~

NA=Not Available.
a Data from records in the entanglement and strandings data base maintained by the New England Aquarium and the Northeast Regional Office/NMFS (Entanglement and Strandings).

Other Mortality
U.S.

There is evidence that harbor porpoises were harvested by natives in Maine and Canada before the 1960's, and the meat was used for human consumption, oil, and fish bait (NEFSC 1992). The extent of these past harvests is unknown, though it is believed to have been small. Up until the early 1980's, small kills by native hunters (Passamaquoddy Indians) were reported. In recent years it was believed to have nearly stopped (Polacheck 1989) until media reports in September 1997 depicted a Passamaquoddy tribe member dressing out a harbor porpoise. Further articles describing use of porpoise products for food and other purposes were timed to coincide with ongoing legal action in state court.

During 1993, 73 harbor porpoises were reported stranded on beaches from Maine to North Carolina (Smithsonian Marine Mammal Database). Sixty-three of those harbor porpoises were reported stranded in the U.S. mid-Atlantic region from New York to North Carolina between February and May. Many of the mid-Atlantic carcasses recovered in this area during this time period had cuts and body damage suggestive of net marking (Haley and Read 1993). Five out of 8 carcasses and 15 heads from the strandings that were examined showed signs of human interactions (net markings on skin and missing flippers or flukes). Decomposition of the remaining animals prevented determination of the cause of death. Earlier reports of harbor porpoise entangled in gillnets in Chesapeake Bay and along the New Jersey coast and reports of apparent mutilation of harbor porpoise carcasses raised concern that the 1993 strandings were related to a coastal net fishery, such as the American shad coastal gillnet fishery (Haley and Read 1993). Between 1994 and 1996, 107 harbor porpoise carcasses were recovered from beaches in Maryland, Virginia, and North Carolina and investigated by scientists. Only juvenile harbor porpoises were present in this sample. Of the 40 harbor porpoises for which cause of death could be established, 25 displayed definitive evidence of entanglement in fishing gear. In 4 cases it was possible to determine that the animal was entangled in monofilament nets (Cox *et al.* 1998).

Records of harbor porpoise strandings prior to 1997 are stored in the Smithsonian's Marine Mammal Database and records from 1997 to present are stored in the NE Regional Office/NMFS strandings and entanglement database. According to these records, the numbers of harbor porpoises that stranded on U.S. beaches from North Carolina to Maine during 1994 to 2004~~3~~ were 106, 86, 94, 118, 59, 228, 27, 113, 79,~~ and~~ 122, and 118, respectively (Table 4). Of these, 3 stranded alive on a Massachusetts beach in 1996, were tagged, and subsequently released. In 1998, 2 porpoises that stranded on a New Jersey beach had tags on them indicating they were originally taken on an observed mid-Atlantic coastal gillnet vessel. During 1999, 6 animals stranded alive and were either tagged and released or brought to Mystic Aquarium for rehabilitation (Table 4).

During 1999, over half of the strandings occurred on beaches of Massachusetts and North Carolina. The states with the next largest numbers were Virginia, New Jersey and Maryland, in that order. The cause of death was investigated for all the 1999 strandings~~ (Table 5)~~. Of these, it was possible to determine that the cause of death of 38 animals was fishery interactions. Of these 38, 19 animals were in an area and time that were not part of a bycatch estimate derived using observer data. Thus, these 19 mortalities are attributed to an unknown gillnet fishery ~~(Table 3)~~. One additional animal was found mutilated (right flipper and fluke was cut off) and cause of death was attributed to an unknown human-caused mortality~~ (Table 5)~~.

During 2000, only 27 harbor porpoises stranded on beaches from Maine to North Carolina (Table 4). Of these, most came from Massachusetts (8) or North Carolina (6). The cause of death for 1 animal was in an area and time that was not part of a bycatch estimate derived from observer data, and thus was attributed to an unknown gillnet fishery (Tables 3 and 5). This animal was found on a beach in Virginia during May with mono-filament line wrapped around it. In addition, 1 animal was found mutilated and so cause of death was attributed to an unknown human-caused mortality (Table 5).

During 2001, 113 harbor porpoises were reported stranded on an Atlantic US beach, of these most came from Massachusetts (39), Virginia (28), and North Carolina (21) (Table 4). Thirteen of these strandings displayed signs of fishery interactions, and of these, 3 animals were in an area and time that were not part of a bycatch estimate derived from the observer data (Tables 3 and 5).

During 2002, 79 harbor porpoises were reported stranded on an Atlantic US beach, of which over half come from Massachusetts (42) (Table 4). Eleven animals displayed signs of emaciation and two signs of fishery interactions (Table 4). Both of the strandings with fishery interactions were in the mid-Atlantic (Maryland and Virginia) during March and were not in a time and area that was part of a bycatch estimate derived from observer data (Tables 3 and 5).

During 2003, 122 harbor porpoises were reported stranded, of which approximately 1/3 came from Massachusetts (35) and an additional 1/3 came from North Carolina (39) (Table 4). The number of reported fishery interactions by state are: 1 in Massachusetts (October), 1 in Maryland (March), 6 in Virginia (3 in March, 2 in April, and 1 in May), and 1 in North Carolina (February). Three harbor porpoises were reported mutilated in North

Carolina. All of these strandings reported with fishery interactions were in areas and times that were not part of a bycatch estimate derived from the observer data (Tables 3 and 5).

During 2004, 118 harbor porpoises were reported stranded on an Atlantic US beach, of which about 40% came from Massachusetts (49) (Table 4). There were 16 strandings in Maine, the highest number for Maine on recent record. There were 8 reported fishery interactions by state are: 1 in Massachusetts (May), 1 in New York (May), and 3 in Virginia (February, March, and April), and 3 in North Carolina (April). In addition, there was 1 mutilation in Delaware during March. Of these 8 fishery interactions, six were in areas and times that were not part of a bycatch estimated derived from the observer data (Tables 3 and 5).

Averaging 2000~~1999~~ to 2004~~3~~, there were 1.2 animals per year that were stranded and mutilated and so cause of death was attributed to an unknown human-caused mortality (Table 5).

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

Table 4. Summary of number of stranded harbor porpoises in the U.S. and Nova Scotia during January 1, 2000~~1999~~ to December 31, 2004~~3~~, by year and area.

Area	Year					Total
	2000	2001	2002	2003	2004	
Maine[a]	2	4	8	5	16	35
New Hampshire	0	0	2	2	2	6
Massachusetts[b]	8	39	42	35	49	173
Rhode Island	0	1	1	2	3	7
Connecticut	0	0	1	0	0	1
New York[c]	2	7	6	8	8	31
New Jersey	2	6	6	5	14	33
Delaware	1	3	3	1	1	9
Maryland	3	4	1	5	2	15
Virginia	3	28	6	19	8	64
North Carolina	6	21	3	39	15	84
Florida	0	0	0	1	0	1
TOTAL U.S.	27	113	79	122	118	459
Nova Scotia	3	2	5	3	4	17
GRAND TOTAL	30	115	84	125	122	476

a In Maine, one animal stranded alive in March 2002, brought to Mystic Aquarium but died 2 days later.

b In Massachusetts, during 1999, five animals stranded alive and were tagged and released. During 2002, three animals stranded alive and were rehabilitated at Mystic Aquarium (1 in February, March and May).

c In New York, one animal stranded alive in 1999, rehabilitated at Mystic Aquarium and died at the aquarium in April 2000.

Table 5. Cause of mortality of U.S. stranded harbor porpoises during January 1, 2000~~1999~~ to December 31, 2004~~3~~. “Unique FI” is a fishery interaction that is in a time and area that could not be part of the mortality estimate derived from the observer program. “Not unique FI” is a fishery interaction that was in a time and area that may be part of the observer program derived mortality estimate. “No FI” is the cause of death was determined not to be related to a fishery interaction. “Alive” is stranded animal not dead. “CBD/Unk” is cause of death could not be determined or was unknown.

Year	Unique FI[a]	Mutilation[b]	Not unique FI	No FI	Emaciated	CBD/Unk	Alive	Total
~~1999~~	~~19~~	~~1~~	~~19~~	~~41~~	~~30~~	~~112~~	~~6~~	~~228~~
2000	1	1	0	2	0	22	0	26
2001	3	1	10	32	0	64	3	113
2002	2	0	0	2	11	60	4	79
2003	9	3	0	61	3	44	2	122
2004	6	1	2	38	4	59	8	118
Avg 00-04~~99-03~~	4.2~~6.8~~	1.2	2.4~~5.8~~	27.0~~6~~	3.6~~8.8~~	49.8~~60.6~~	3.4~~3.0~~	91.6~~113.6~~

a. Attributed to an unknown fishery.

b. Attributed to an unknown human-caused mortality.

CANADA

The Nova Scotia Stranding Network documented whales and dolphins stranded between 1991 and 1996 on the coast of Nova Scotia (Hooker *et al.* 1997). Researchers with the Dept. of Fisheries and Oceans, Canada documented strandings on the beaches of Sable Island during 1970 to 1998 (Lucas and Hooker 2000). Sable Island is approximately 170km southeast of mainland Nova Scotia. On the mainland of Nova Scotia, a total of 8 stranded harbor porpoises were recorded between 1991 and 1996: 1 in May 1991, 2 in 1993 (July and September), 1 in August 1994 (released alive), 1 in August 1994, and 3 in 1996 (March, April, and July (released alive)). On Sable Island, 8 stranded dead harbor porpoises were documented, most in January and February; 1 in May 1991, 1 in January 1992, 1 in January 1993, 3 in February 1997, 1 in May 1997, and 1 in June 1997. Two strandings during May-June 1997 were neonates (> 80 cm). The harbor porpoises that stranded in the winter (January-February) were on Sable Island, those in the spring (March to June) were in the Bay of Fundy (2 in Minas Basin and 1 near Yarmouth) and on Sable Island (2), and those in the summer (July to September) were scattered along the coast from the Bay of Fundy to Halifax.

Whales and dolphins stranded between 1997 and 2004 on the coast of Nova Scotia as recorded by the Marine Animal Response Society (MARS) and the Nova Scotia Stranding Network are as follows (Table 4): 3 harbor porpoises stranded in 1997 (1 in April, 1 in June and 1 in July), 2 stranded in June 1998, 1 in March 1999, 3 in 2000 (1 in February, 1 in June, and 1 in August); 2 in 2001 (1 in July and 1 in December), 5 in 2002 (3 in July (1 released alive), 1 in August, and 1 in September (released alive)), 3 in 2003 (2 in May (1 was released alive) and 1 in June (disentangled and released alive)) and 4 in 2004 (1 in April, 1 in May, 1 in July (released alive) and 1 in November).

STATUS OF STOCK

The status of harbor porpoises, relative to OSP, in the U.S. Atlantic EEZ is unknown. On January 7, 1993, the National Marine Fisheries Service (NMFS) proposed listing the Gulf of Maine harbor porpoise as threatened under the Endangered Species Act (NMFS 1993). On January 5, 1999, NMFS determined the proposed listing was not warranted (NMFS 1999). On August 2, 2001, NMFS made available a review of the biological status of the Gulf of Maine/Bay of Fundy harbor porpoise population. The determination was made that listing under the Endangered Species Act (ESA) was not warranted and this stock was removed from the ESA candidate species list (NMFS 2001). There are insufficient data to determine population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury does not exceed PBR, though the fishery-related bycatch has been increasing over the last three years (2002-2004).

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~~December~~April
~~November 2005~~ 2006

HARBOR SEAL (*Phoca vitulina*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The harbor seal is found in all nearshore waters of the Atlantic Ocean and adjoining seas above about 30°~~º0~~N (Katona et al. 1993). In the western North Atlantic, they are distributed from the eastern Canadian Arctic and Greenland south to southern New England and New York, and occasionally to the Carolinas (Mansfield 1967; Boulva and McLaren *1979*; Katona *et al.* 1993; Gilbert and Guldager 1998; Baird 2001). Stanley *et al.* (1996) examined worldwide patterns in harbor seal mitochondrial DNA, which indicate that western and eastern North Atlantic harbor seal populations are highly differentiated. Further, they suggested that harbor seal females are only regionally philopatric, thus population or management units are on the scale of a few hundred kilometers. Although the stock structure of the western North Atlantic population is unknown, it is thought that harbor seals found along the eastern U.S. and Canadian coasts represent one population (Temte *et al.* 1991). In U.S. waters, breeding and pupping normally occur in waters north of the New Hampshire/Maine border, although breeding occurred as far south as Cape Cod in the early part of the twentieth century (Temte *et al.* 1991; Katona *et al.* 1993).

Harbor seals are year-round inhabitants of the coastal waters of eastern Canada and Maine (Katona *et al.* 1993), and occur seasonally along the southern New England and New York coasts from September through late May (Schneider and Payne 1983). In recent years, their seasonal interval along the southern New England to New Jersey coasts has increased (Barlas 1999; Hoover *et al.* 1999; Slocum *et al.* 1999; ~~Schroeder 2000~~Schroeder 2000; deHart 2002). Scattered sightings and strandings have been recorded as far south as Florida (NMFS unpublished data). A general southward movement from the Bay of Fundy to southern New England waters occurs in autumn and early winter (Rosenfeld *et al.* 1988; Whitman and Payne 1990; Barlas 1999; Jacobs and Terhune 2000). A northward movement from southern New England to Maine and eastern Canada occurs prior to the pupping season, which takes place from mid-May through June along the Maine Coast (Richardson 1976; Wilson 1978; Whitman and Payne 1990; Kenney 1994; deHart 2002). No pupping areas have been identified in southern New England (Payne and Schneider 1984; Barlas 1999). More recent information suggests that pupping is occurring at high-use haulout sites off Manomet, Massachusetts (B. Rubinstein, pers. comm., New England Aquarium). The overall geographic range throughout coastal New England has not changed significantly during the last century (Payne and Selzer 1989).

Prior to spring 2001 live capture and radio tagging of adult harbor seals, including a pregnant female, in Chatham, Massachusetts (Waring *et al.* in press), it was believed that the majority of seals moving into southern New England and mid-Atlantic waters are subadults and juveniles (Whitman and Payne 1990; Katona *et al.* 1993; Slocum *et al.* 1999). Seventy-five percent (9/12) of the tagged seals were detected at least once during the May/June 2001 abundance survey along the Maine coast (Gilbert *et al*. 2005; Waring *et al*. in press).

POPULATION SIZE

Since passage of the MMPA in 1972, the observed count of seals along the New England coast has been increasing. Five coast-wide aerial surveys along the Maine coast have been conducted in May/June during pupping. Uncorrected counts, with number of pups in parentheses, between 1981 and 2001 were 10,543 (676) in 1981, 12,940 (1,713) in 1986, 29,538 (4,257) in 1993, 31,078 (5,395) in 1997 and 38,014 (9,282) in 2001 (Table1; Gilbert and Stein 1981; Gilbert and Wynne 1983, 1984; Kenney 1994; Gilbert and Guldager 1998; Gilbert *et al.* 2005). As recommended in the GAMMS Workshop Report (Wade and Anglis 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations. The 2001 survey, conducted in May/June, included replicate surveys and radio tagged seals to obtain a correction factor for animals not hauled out. The corrected estimate for 2001 is 99,340 (23,722). Prior to 2001, the numbers are considered to be a minimum abundance estimate because they are uncorrected for animals in the water or outside the survey area. In addition, the surveys conducted in 1981 and 1986 were conducted in late June, after peak pupping. The 2001 observed count of 38,014 is 28.7% greater than the 1997 count. Increased abundance of seals in the northeast region has also been documented during aerial and boat surveys of overwintering haul-out sites from the Maine/New Hampshire border to eastern Long Island and New Jersey (Payne and Selzer 1989; Rough 1995; Barlas 1999; Hoover *et al.* 1999; Slocum *et al.* 1999; deHart 2002).

Canadian scientists counted 3,500 harbor seals during an August 1992 aerial survey in the Bay of Fundy (Stobo and Fowler 1994), but noted that the survey was not designed to obtain a population estimate. The Sable Island population was the largest in eastern Canada in the late 1980's, however~~,~~ recently the number has drastically declined (Baird 2001). Similarly, pup production declined on Sable Island from 600 in 1989 to 30 in 1997 (Baird 2001). Possible reasons for this decline may be increased use of the island by gray seals and increased predation by sharks (Stobo and Lucas 2000).

Table 1. Summary of abundance estimates for the western Atlantic harbor seal. Month, year, and area covered during each abundance survey, resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	**Area**	**N_{best}** [a]	**CV**
May/June 1997	Maine coast	~~30,990~~ 31,078 (5,395)	None reported
May/June 2001	Maine coast	99,340 (23,722) [b]	CV=.097

a. Pup counts are in brackets
b. Corrected estimate based on uncorrected count of 38,011 (9,278)

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for harbor seals is 99,340 (CV=.097). The minimum population estimate is 91,546 based on corrected total counts along the Maine coast in~~-~~ 2001.

Current Population Trend

Between 1981 and 2001, the uncorrected counts of seals increased from 10,543 to 38,014, an annual rate of 6.6 percent (Gilbert *et al*. 2005).

Possible factors contributing to harbor seal population increase include MMPA protection, fishery management regulations (e.g., closed areas, fishing effort reduction) designed to rebuild groundfish stocks, and possible increased food availability.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently unavailable for this population. Based on uncorrected haulout counts over the 1981 to 2001 survey period, the harbor seal population is growing at approximately 6.6% (Gilbert *et al.* 2005). However, a population grows at the maximum growth rate (R_{MAX}) only when it is at a very low level; thus the 6.6% growth rate is not considered to be a reliable estimate of (R_{MAX}). For purposes of this assessment, the maximum net productivity rate was assumed to be 0.12. This value is based on theoretical modeling showing that pinniped populations may not grow at rates much greater than 12% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate (½ of 12%), and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 91,546. The recovery factor (F_R) for this stock is 1.0, the value for stocks of unknown status, but known to be increasing. PBR for U.S. waters is 5,493.

ANNUAL HUMAN-CAUSED MORTALITY

For the period ~~1999-2003~~2000-2004 the total human caused mortality and serious injury to harbor seals is estimated to be ~~1,051~~ 925 per year. The average is derived from two components: 1) ~~1,032 905~~908 (CV=~~0.17~~0.18; Table 2) from the ~~1999-2003~~ 2000-2004 observed fishery; and 2) ~~19~~ 19 from average ~~1999-2003~~ 2000-2004 stranding mortalities resulting from boat strikes, power plant entrainments, shooting, and other sources (NMFS unpublished data).

Researchers and fishery observers have documented incidental mortality in several fisheries, particularly within the Gulf of Maine (see below). An unknown level of mortality also occurred in the mariculture industry (i.e., salmon farming), and by deliberate shooting (NMFS unpublished data). However, no data are available to determine whether shooting still takes place.

Fishery Information

Detailed Fishery information is given in Appendix III.

U.S.

Earlier Interactions

Incidental takes of harbor seals have been recorded in groundfish gillnet, herring purse seine, halibut tub trawl, and lobster fisheries (Gilbert and Wynne, 1985 and 1987). A study conducted by the University of Maine reported a combined average of 22 seals entangled annually by 17 groundfish gillnetters off the coast of Maine (Gilbert and Wynne 1987). All seals were young of the year and were caught from late June through August and in early October. Interviews with a limited number of mackerel gillnetters indicated only one harbor seal entanglement and a negligible loss of fish to seals. Net damage and fish robbing were not reported to be a major economic concern to gillnetters interviewed (Gilbert and Wynne 1987).

Herring purse seiners have reported accidentally entrapping seals off the mid-coast of Maine, but indicated that the seals were rarely drowned before the seine was emptied (Gilbert and Wynne 1985). Capture of seals by halibut tub trawls is rare. One vessel captain indicated that he took one or two seals a year. These seals were all hooked through the skin and released alive, indicating they were snagged as they followed baited hooks. Infrequent reports suggest seals may rob bait off longlines, although this loss is considered negligible (Gilbert and Wynne 1985).

Incidental takes in lobster traps in inshore waters off Maine are reportedly rare. Captures of approximately two seal pups per port per year were recorded by mid-coastal lobstermen off Maine (Gilbert and Wynne 1985). Seals have been reported to rob bait from inshore lobster traps, especially in the spring, when fresh bait is used. These incidents may involve only a few individual animals. Lobstermen claim that seals consume shedding lobsters, but there are no data to support this.
Current: Commercial fisheries observed for harbor seal bycatch are the Northeast Sink Gillnet, Mid-Atlantic Coastal Gillnet, and North Atlantic Bottom Trawl fisheries.

Northeast Sink Gillnet:

The fishery has been observed in the Gulf of Maine and in southern New England (Williams 1999; NMFS unpublished data). There were harbor seal mortalities observed in the Northeast sink gillnet fishery between 1990 and 2003, excluding three animals taken in the 1994 pinger experiment (NMFS unpublished data). Williams (1999) aged 261 harbor seals caught in this fishery from 1991 to 1997, and 93% were juveniles (e.g. less than four years old). Annual estimates of harbor seal bycatch in the Northeast sink gillnet fishery reflect seasonal distribution of the species and of fishing effort. Estimated annual mortalities (CV in parentheses) from this fishery during ~~1999-2003 were 332 in 1998 (0.33), 1,446 in 1999 (0.34),~~ 2000-2004 were 917 (0.43) in 2000, 1,471 (0.38) in 2001, 787 (0.32) in 2002, ~~and~~ 542 (0.28) in 2003 and ~~792~~ 786 (0.34) in 2004 (Table 2). There were ~~1,~~ 5, 8, 2, ~~and~~ 2, and 9 unidentified seals observed during ~~1999-2003~~2000-2004, respectively. Since 1997, unidentified seals have not been prorated to a species. This is consistent with the treatment of other unidentified mammals that do not get prorated to a specific species. Average annual estimated fishery-related mortality and serious injury to this stock attributable to this fishery during ~~1999-2003~~ 2000-2004was ~~1,032~~ 901 harbor seals (CV=~~0.17~~0.18) (Table 2). The stratification design used is the same as that for harbor porpoise (Bravington and Bisack 1996). The bycatch occurred in the Midcoast closure region (2) and east of Cape Cod (1) between January and April. Between May and August 6 animals were caught off Massachusetts and New Hampshire, and between September and December 4 were caught in the Midcoast closure area.

Mid-Atlantic ~~Coastal~~ Gillnet

No harbor seals were taken in observed trips during 1993-1997, and 1999-2003. Two harbor seals were observed taken in 1998, and one in 2004. Observed effort was distributed from New York to North Carolina year-round ~~from 1 to 50 miles off the beach~~. The 2004 bycatch was in December off of New Jersey. ~~All bycatches were documented during January to April.~~ Using the observed takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 0 in 1995-1997 and 1999-2003 ~~and~~ 11 in 1998 (0.77), and ~~15~~ 28 (0.~~86~~77) in 2004. Average annual estimated fishery-related mortality attributable to this fishery during ~~1999-2003~~ 2000-2004 was ~~zero~~4 7 (CV =0.~~86~~77) harbor seals. In 2002, 65% of observer coverage was concentrated in one area and not distributed proportionally across the fishery. Therefore observed mortality is considered unknown in 2002.

Northeast Bottom Trawl

Vessels in the North Atlantic bottom trawl fishery, a Category III fishery under MMPA, were observed in order to meet fishery management needs, rather than marine mammal management needs. In 2005 list of fisheries (LOF) this fishery has been elevated to Category II. No mortalities were observed between 1991 ~~to~~and 1999, ~~2001~~ and 4 mortalities were observed between 2000 and 2004 ~~in 2002,~~ (Table 2). Observer coverage, expressed as number of trips, was < 1% from 1998 to 2001, and 2% in 2002 (Table 2). The estimated annual fishery-related mortality and serious injury attributable to this fishery are currently being determined.

Gulf of Maine Atlantic Herring Purse Seine Fishery

The Gulf Of Maine Atlantic Herring Purse Seine Fishery is a Category III fishery. This fishery was not observed until 2003. No mortalities have been observed, but 11 harbor seals were captured and released alive.

CANADA

Currently, scant data are available on bycatch in Atlantic Canada ~~-~~fisheries due to a lack of observer programs (Baird 2001). An unknown number of harbor seals have been taken in Newfoundland, Labrador, Gulf of St. Lawrence and Bay of Fundy groundfish gillnets, Atlantic Canada and Greenland salmon gillnets, Atlantic Canada cod traps, and in Bay of Fundy herring weirs (Read 1994). Furthermore, some of these mortalities (e.g., seals trapped in herring weirs) are the result of direct shooting.

In 1996, observers recorded 7 harbor seals (one released alive) in Spanish deep-water trawl fishing on the southern edge of the Grand Banks (NAFO Areas 3) (Lens, 1997). Seal bycatches occurred year-round, but interactions were highest during April-June. Many of the seals that died during fishing activities were unidentified. The proportion of sets with mortality (all seals) was 2.7 per 1,000 hauls (0.003).

Table 2. Summary of the incidental mortality of harbor seals (*Phoca vitulina*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [a]	Observer Coverage [b]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northeast [c] Sink Gillnet	00-04 ~~301~~	301	Obs. Data Weighout,	.06, .04, .02, .03, .06	26, 32, 12, 21, 45	917, 1471, 787, 542, ~~792~~786	.43, .38, .32, .28, .34	~~902~~ 901 (0.18)
mid-Atlantic ~~Coastal Sink~~ Gillnet	00-04	unk [d]	Obs. Data Weighout	.02, .02, .01, .01, .02	0, 0, unk [e], 0, 1	0, 0, unk [e], 0, ~~15~~28	0, 0, unk [e], 0, .~~86~~77	~~4~~ 7 (0.~~86~~77) [e]
North ~~Atlantic~~east Bottom Trawl	00-04	tbd	Obs. Data Weighout	.004, .004, .021, 028 .045	0, 0, 4, 0, 0	0, 0, tbd [f], 0, 0	0, 0, tbd [f], 0, 0	tbd [f]
TOTAL								~~1032~~ ~~(0.17~~ ~~905~~908 (0.18)

a. Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries ~~Science Center (NEFSC) Sea Sampling~~Observer Program. NEFSC collects landings data (Weighout), and total landings are used as a measure of total effort for the sink gillnet fishery. Mandatory logbook (Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast sink gillnet fishery.

b. The observer coverage for the Northeast sink gillnet fishery and the mid-Atlantic coastal gillnet fisheries are measured in tons of fish landed.

c. Since 1998, takes from pingered and non-pingered nets within a marine mammal time/area closure that required pingers, and takes from pingered and non-pingered nets not within a marine mammal time/area closure were pooled. The pooled bycatch rate was weighted by the total number of samples taken from the stratum and used to estimate the mortality. In 2000 - 2004, respectively, 8, 10, 3, 0, 8 takes were observed in nets with pingers. In 2000 – 2004, respectively, 18, 22, 9, 21, 37 takes were observed in nets without pingers.

d. Number of vessels is not known.

e. Sixty-five percent of sampling in the mid-Atlantic coastal gillnet by the NEFSC fisheries observer program was concentrated in one area off the coast of Virginia. Because of the low level of sampling that was not distributed proportionately throughout the mid-Atlantic region observed mortality is considered unknown in 2002. The four year average (2000-2001, 2003, and 2004) estimated mortality was applied as the best representative estimate.

f. Analysis of bycatch mortality attributed to the Northeast bottom trawl fishery for the years 2000-2004 is in progress. The estimates will not be reported until the analysis and scientific review is complete. Complete review is anticipated prior to the commencement of the Atlantic trawl take reduction team in September 2006.

Other Mortality

Historically, harbor seals were bounty hunted in New England waters, which may have caused a severe decline of this stock in U.S. waters (Katona *et al.* 1993). Bounty hunting ended in the mid-1960's.

Currently, aquaculture operations in eastern Canada are licensed to shoot nuisance seals, but the number of seals killed is unknown (Baird 2001). Other sources of harbor seal mortality include human interactions, storms, abandonment by the mother, disease, and predation (Katona *et al.* 1993; Jacobs and Terhune 2000; NMFS unpublished data). Mortalities caused by human interactions include boat strikes, fishing gear interactions, power plant entrainment, oil spill/exposure, harassment, and shooting.

Small numbers of harbor seals strand each year throughout their migratory range. Stranding data provide insight into some of these sources of mortality. ~~From 1999-2003, 1,432 harbor seal strandings were reported (150 in 1999, 219 in 2000, 246 in 2001, 337 in 2002, and 479 in 2003) in all states between Maine and North Carolina (Table 3; NMFS unpublished data). Ninety-nine (6.9%) of the seals stranded during this five year period showed signs of human interaction as a direct cause of mortality.~~ From 2000-2004, 2,059 harbor seal strandings were reported (219 in 2000, 246 in 2001, 337 in 2002, 479 in 2003, and 774 in 2004) in all states between Maine and North Carolina (Table 3; NMFS unpublished data). Ninety-nine (4.8%) of the seals stranded during this five year period showed signs of human interaction as a direct cause of mortality. An Unusual Mortality Event (UME) was declared for harbor seals in northern Gulf of Maine waters during 2004.

Table 3. Harbor seal (*Phoca vitulina*) reported strandings along the U.S. Atlantic coast (2002-~~2003~~2004).

State	**2002**	**2003**	**2004[c]**	**Total**
Maine	183	259	509[a]	951
New Hampshire	3	15	24	42
Massachusetts	108	109	170	387
Rhode Island	4	12	12	28
Connecticut	0	1	3	4
New York	18	22	31	71
New Jersey	15	30	16 ~~2~~[b]	61
Delaware	0	2	0	2
Maryland	0	2	1	3
Virginia	3	6	5	14
North Carolina	3	23	4	30
Florida	0	0	1	1
Total	337	481	776	1,594

a. Unusual Mortality Event (UME) declared for harbor seals in northern Gulf of Maine waters during 2004.

b. Harbor seals were treated and released in New Jersey.

c. During 2004, the Northeast region had 37 seal strandings where species could not be determined. In 2004, 13 harbor seals had signs of human interaction as the cause of death.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

-Stobo and Lucas (2000) have documented shark predation as an important source of natural mortality at Sable Island, Nova Scotia. They suggest that shark-inflicted mortality in pups, as a proportion of total production, was less than 10% in 1980-1993, approximately 25% in 1994-1995, and increased to 45% in 1996. Also, shark predation on adults was selective towards mature females. They suggest that the combined predation mortality is likely impacting the Sable Island population growth, and may be contributing to the observed population decline.

STATUS OF STOCK

-The status of harbor seals, relative to OSP, in the U.S. Atlantic EEZ is unknown, but the population is increasing. The species is not listed as threatened or endangered under the Endangered Species Act. Gilbert *et al.* 2005 estimated a 6.6% annual rate of increase of this stock in Maine coastal waters based on 1981 to 2001 surveys conducted along the Maine coast. The population is increasing despite the known fishery-related and other human sources of mortality. Total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be approaching zero mortality and serious injury rate. This is not a strategic stock because fishery-related mortality and serious injury does not exceed PBR.

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~~November January~~April ~~2005~~ 2006

GRAY SEAL (*Halichoerus grypus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The gray seal is found on both sides of the North Atlantic, with three major populations: eastern Canada, northwestern Europe and the Baltic Sea (Katona *et al.* 1993). The western North Atlantic population occurs from New England to Labrador and is centered in the Sable Island region of Nova Scotia (Mansfield 1966; Katona *et al.* 1993; Davies 1957; Lesage and Hammill 2001). This stock is separated by geography, differences in the breeding season, and mitochondrial DNA variation from the eastern Atlantic stock (Bonner 1981; Boskovic *et al.* 1996; Lesage and Hammill 2001). There are two breeding concentrations in eastern Canada; one at Sable Island, and a second that breeds on the pack ice in the Gulf of St. Lawrence (Laviguer and Hammill 1993). Tagging studies indicate that there is little intermixing between the two breeding groups (Zwanenberg and Bowen 1990) and, for management purposes, they are treated as separate populations (Mohn and Bowen 1996). Small numbers of animals and pupping have been observed on several isolated islands along the Maine coast and in Nantucket-Vineyard Sound, Massachusetts (Katona *et al.* 1993; Rough 1995; J. R. Gilbert, pers. comm., University of Maine, Orono, ME). In the late 1990's, a year-round breeding population of approximately 400+ animals was documented on outer Cape Cod and Muskeget Island (D. Murley, pers. comm., Mass. Audubon Society, Wellfleet, MA). In December 2001, NMFS initiated aerial surveys to monitor gray seal pup production on Muskeget Island and at the Monomoy National Wildlife Refuge (NWR; S. Wood, pers. comm., University of Massachusetts, Boston, MA). Gilbert (pers. comm.) has also documented resident colonies and pupping in Maine since 1994.

POPULATION SIZE

Current estimates of the total western Atlantic gray seal population are not available; although estimates of portions of the stock are available for select time periods. The Canadian population, inhabiting the Gulf of St. Lawrence and Sable Island, appears to be growing. A 1993 survey estimated the population at 144,000 animals (~~Anon~~DFO~~.~~ 2003, Mohn and Bowen 1996) and a 1997 survey estimated 195,000 (~~Anon~~DFO~~.~~ 2003). While the overall population in increasing, the population at Sable Island is increasing by approximately 13% per year, while the population in the Gulf of St. Lawrence is declining (Bowen *et al*. 2003).

The population in US waters is also increasing. Maine coast-wide surveys conducted during summer (all other surveys were conducted January-May) revealed 597 and 1,731 gray seals in 1993 and 2001, respectively (Gilbert *et al*. 2005). In 2002, the maximum counts of two breeding colonies in Maine, with number of pups in parentheses, were 193 (9) on Seal Island and 74 (31) on Green Island (S. Wood, pers. comm.). Gray seal numbers are increasing in Massachusetts at Muskeget Island off the coast of Nantucket, and at Monomoy Island, off the coast Chatham, Cape Cod. Pup counts on Muskeget have increased from 0 in 1989 to 1,023 in 2002 (Rough 1995, S. Wood, pers. comm.). Gray seal numbers increase in this region in the spring (April-May) when molting occurs. In April-May 1994 a maximum count of 2,010 was obtained for Muskeget Island and Monomoy combined (Rough 1995). In March 1999 a maximum count of 5,611 was obtained in the region south of Maine (between Isles of Shoals, NH and Woods Hole, MA) (Barlas 1999). No gray seals were recorded at haul out sites between Newport, RI and Montauk Pt., NY (Barlas 1999), although, more recently small numbers of gray seals have been recorded in this region (deHart 2002; R. DiGiovanni, pers. comm., Riverhead Foundation, Riverhead, NY). Recently, a small number of gray seals have maintained a winter presence in the Woods Hole region (Vineyard Sound) (deHart 2002).

Table 1. Summary of abundance estimates for the western North Atlantic gray seal. Month, year, and area covered during each abundance survey, resulting abundance estimate (N_{min}) and coefficient of variation (CV).

Month/Year	Area	N_{min} [a]	CV
March 1999	Muskeget Island and Monomoy NWR, MA	5,611	None reported
May 2001	Maine coast	1,731	None reported

[a] These counts pertain to animals seen in U.S. waters, and the stock relationship to animals in Canadian waters is unknown.

Minimum Population Estimate

Present data are insufficient to calculate the minimum population estimate for U.S. waters. It is estimated that there are at least 195,000 gray seals in Canada (~~Anon.~~DFO 2003).

Current Population Trend

Gray seal abundance is likely increasing in the U.S. Atlantic Exclusive Economic Zone (EEZ), but the rate of increase is unknown. The population in eastern Canada was greatly reduced by hunting and bounty programs, and in the 1950's the gray seal was considered rare (Lesage and Hammill 2001). Bounty and culling programs also occurred between 1976 and 1983, removing approximately 1,720 animals per year (~~Anon.~~DFO 2002). The Sable Island population was less affected and has been increasing for several decades . Pup production on Sable Island, Nova Scotia, has been about 13% per year since 1962 (Stobo and Zwanenberg 1990; Mohn and Bowen 1996); whereas, in the Gulf of St. Lawrence the population appears to be declining, and may have been declining since 1990 (~~Anon.~~DFO 2003). Approximately 57% of the western North Atlantic population is from the Sable Island stock. In recent years pupping has been established on Hay Island, off the Cape Breton coast (Lesage and Hammill 2001).

Winter breeding colonies in Maine and on Muskeget Island may provide some measure of gray seal population trends and expansion in distribution. Sightings in New England increased during the 1980's as the gray seal population and range expanded in eastern Canada. Five pups were born at Muskeget in 1988. The number of pups increased to 12 in 1992, 30 in 1993, and 59 in 1994 (Rough 1995). In January 2002, between 883 - 1,023 pups were counted on Muskeget Island and surrounding shoals (S. Wood, pers. comm.). These observations continue the increasing trend in pup production reported by Rough (1995). NMFS recently initiated a collaborative program with the University of Massachusetts, Boston and University of Maine to monitor gray seal population trends and pup production in New England waters. The change in gray seal counts at Muskeget and Monomoy from 2,010 in 1994 to 5,611 in 1999 represents an annual increase rate of 20.5%, however, it can not be determined what proportion of the increase represents growth or immigration.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. One study estimated an annual or net productivity increase in pup production of 13% on Sable Island (Mohn and Bowen 1996; Bowen *et al*. 2003).
For purposes of this assessment, the maximum net productivity rate was assumed to be 0.12. This value is based on theoretical modeling showing that pinniped populations may not grow at rates much greater than 12% given the constraints of their reproductive life history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is unknown. The maximum productivity rate is 0.12, the default value for pinnipeds. The recovery factor (F_R) for this stock is 1.0, the value for stocks of unknown status, but is known to be increasing. PBR for the western North Atlantic gray seals in U.S. waters is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

For the period ~~1999-2003~~2000~~2000~~-2004~~2004~~, the total estimated human caused mortality and serious injury to gray seals was ~~274~~ 370 per year. The average was derived from three components: 1) ~~141~~227~~228~~ (CV=~~0.26~~ 0.22~~0.22~~) (Table 2) from the~~ 1999-2003~~ 2000-2004~~2000-2004~~ U.S. observed fishery; 2) ~~3~~5 from average ~~1999-2003~~ 2000-2004 stranding mortalities in U.S. waters resulting from power plant entrainments, oil spill, shooting, boat strike, and other sources (NMFS unpublished data), and 3) ~~130~~ 138 from average ~~1999-2003~~ 2000-2003~~2000-2003~~ kill in the Canadian hunt (~~Anon.~~DFO 2003, Stenson unpublished data).

Fishery Information

Detailed fishery information is given in Appendix III.

U.S.

Northeast Sink Gillnet

There were ~~52~~ 83 gray seal mortalities observed in the Northeast sink gillnet fishery between 1993 and ~~2003~~ 2004. Annual estimates of gray seal bycatch in the Northeast sink gillnet fishery reflect seasonal distribution of the species and of fishing effort. Estimated annual mortalities (CV in parentheses) from this fishery was 0 in 1990-1992, 18 in 1993 (1.00), 19 in 1994 (0.95), 117 in 1995 (0.42), 49 in 1996 (0.49), 131 in 1997 (0.50),61 in 1998 (0.98), 155 in 1999 (0.51), 193 in 2000 (0.55), 117 in 2001 (0.59), 0 in 2002, ~~and~~ 242 (0.47) in 2003, and ~~504~~498 (0.3~~4~~5) in 2004 (Table 2). There were ~~1,~~ 5, 8, 2, ~~and~~ 2 and 9 unidentified seals observed during ~~1999 to 2003~~2000-2004, respectively. Since 1997 unidentified seals have not been prorated to a species. This is consistent with the treatment of other unidentified mammals that do not get prorated to a specific species. Average annual estimated fishery-related mortality and serious injury to this stock attributable to this fishery during ~~1999-2003 was 141 gray seals (CV=0.26)~~ 2000-2004 was 21~~1~~0 gray seals (CV=0.23) (Table 2). The stratification design used is the same as that for harbor porpoise (Bravington and Bisack 1996).

Mid-Atlantic Coastal Gillnet

No gray seals were taken in observed trips during 1998-2000, and 2003. One gray seal was observed taken ~~during a "fish trip" (not "marine mammal trip")~~ in 2001 and one in 2004 (Table 2). ~~Therefore, the annual (2001) mean mortality was not estimated.~~ ~~The~~ In 2001, the gray seal was taken at a 44 fathom depth during the month of April off the coast of New Jersey near Hudson Canyon. The 2004 take was off Virginia in April. Observed effort was scattered between ~~Delaware~~ New Jersey and North Carolina from 1 to 50 miles off the beach. In 2002, 65% of sampling was concentrated in one area and not distributed proportionally across the fishery. Therefore, observed mortality is considered unknown in 2002. Average annual estimated fisher-related mortality and serious injury to this stock attributable to this fishery during 2000-2004 was 17 gray seals (CV=0.92)(Table 2).

CANADA

An unknown number of gray seals have been taken in Newfoundland and Labrador, Gulf of St. Lawrence, and Bay of Fundy groundfish gillnets, Atlantic Canada and Greenland salmon gillnets, Atlantic Canada cod traps, and in Bay of Fundy herring weirs (Read 1994). In addition to incidental catches, some mortalities (e.g., seals trapped in herring weirs) were the result of direct shooting, and there were culls of about 1,700 animals annually during the 1970's and early 1980's on Sable Island (Anon~~.~~ymous 1986).

In 1996, observers recorded 3 gray seals (1 released alive) in Spanish deep-water trawl fishing on the southern edge of the Grand Banks (NAFO Areas 3) (Lens, 1997). Seal bycatches occurred year-round, but interactions were highest during April-June. Many of the seals that died during fishing activities were unidentified. The proportion of sets with mortality (all seals) was 2.7 per 1,000 hauls (0.003).

Table 2. Summary of the incidental mortality of gray seal (*Halichoerus grypus*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type[a]	Observer Coverage[b]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northeast Sink Gillnet[c]	00-04	301	Obs. Data Weighout, Logbooks	.06, .04, .02, .03, .06	5, 2, 0, 5, 21	193, 117, 0, 242, ~~504~~ 498	.55, .59, 0, .47, .~~34~~ 35	~~211~~ 210 (0.23)
Mid-Atlantic ~~Coastal~~ Gillnet[d]	00-04	unk[e]	Obs. Data Weighout	.02, .02, .01, .01, .02	0, 1, unk[e], 0, 1	0, 0, unk[f], 0, 69	0, 0, unk[f], 0, .92	17 (0.92)
TOTAL								~~228~~227 (0.22)

a. Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the ~~Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. NEFSC~~ Northeast Fisheries Observer Program. The Northeast Fisheries Observer Program collects landings data (Weighout), and total landings are used as a measure of total effort for the sink gillnet fishery. Mandatory logbook (Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast multispecies sink gillnet fishery.

b. The observer coverage for the Northeast sink gillnet fishery and the mid-Atlantic coastal gillnet fisheries are measured in tons of fish landed.

c. Since 1998, takes from pingered and non-pingered nets within a marine mammal time/area closure that required pingers, and takes from pingered and non-pingered nets not within a marine mammal time/area closure were pooled. The pooled bycatch rate was weighted by the total number of samples taken from the stratum and used to estimate the mortality. In 1998, 1 take was observed in a net without a pinger that was within a marine mammal closure that required pingers. In 2000 - 2004, respectively, 2, 0, 0, 1, 1 takes were observed in nets with pingers. In 2000 – 2004, respectively, 3, 2, 0, 4, 20 takes were observed in nets without pingers.

d. The one observed take in the mid-Atlantic gillnet fisheries (2001) was on a "fish trip", therefore no mortality estimate was extrapolated. See Bisack (1997) for "trip" type definitions.

e. Number of vessels is not known.

f. Sixty-five percent of sampling in the mid-Atlantic coastal gillnet by the ~~NEFSC~~ Northeast ~~fisheries~~ Fisheries ~~observer~~ Observer ~~program~~ Program was concentrated in one area off the coast of Virginia. Because of the low level of sampling that was not distributed proportionately throughout the mid-Atlantic region observed mortality is considered unknown in 2002. The four year average (2000-2001, 2003, and 2004) estimated mortality was applied as the best representative estimate.

Other Mortality

Canada: In Canada, gray seals were hunted for several centuries by indigenous people and European settlers in the Gulf of St. Lawrence and along the Nova Scotia eastern shore, and were locally extirpated (Lavigueur and Hammill 1993). By the mid 1900's gray seals were considered to be rare, and in the mid 1960's the population in eastern Canada was estimated to be 5,600 (Mansfield 1966). Since the mid-1960's the population has been increasing. During a bounty and culling program (1967-1983), the average annual removals were~~was~~ 1,720 seals (~~Anon.~~DFO 2002). Between 1999-2003 the annual kill of gray seals by hunters in Canada was: 1999 (98), 2000 (342), 2001 (76) 2002 (126), and 2003 (6) (~~Anon.~~DFO 2003; Stenson unpublished data). The traditional hunt of a few hundred animals is expected to continue off the Magdalen Islands and in other areas, except Sable Island where commercial hunting is not permitted (~~Anon.~~DFO 2003).

Canada also issues personal hunting licenses which allows the holder to take 6 grey seals annually (Lesage and Hammill 2001). Hunting is not permitted during the breeding season and some additional seasonal/spatial restrictions are in effect (Lesage and Hammill 2001).

U.S: Gray seals, like harbor seals, were hunted for bounty in New England waters until the late 1960's. This hunt may have severely depleted this stock in U.S. waters (Rough 1995). Other sources of mortality include human interactions, storms, abandonment by the mother, disease, and predation. Mortalities caused by human interactions include boat strikes, fishing gear interactions, power plant entrainment, oil spill/exposure, harassment, and shooting. The Cape Cod stranding network has documented gray seals entangled in netting or plastic debris around the Cape Cod/Nantucket area, and in recent years have made successful disentanglement attempts.

~~From 1999-2003, 321gray seal strandings were recorded, extending from Maine to North Carolina. Most strandings were in Massachusetts (136), New York (55), and Maine (31). Fifteen (4.6%) of the seals stranded during this five year period showed signs of human interaction as a direct cause of mortality. The total number of gray seal strandings in 2002 and 2003 are presented in Table 3.~~ From 1999-2004, 434~~20~~ gray seal strandings were recorded, extending from Maine to North Carolina. Most strandings were in Massachusetts. Twenty-five (5.8~~6~~%) of the seals stranded during this period showed signs of human interaction as a direct cause of mortality.

The total number of gray seal strandings from 2002 to 2004 are presented in Table 3.

Table 3. Gray seal (*Halichoerus grypus*) reported strandings along the U.S. Atlantic coast (2002-2004).

State	2002	2003	2004[a]	Total
Maine	7	6	4	17
New Hampshire	0	1	0	1
Massachusetts	43	64	47	154
Rhode Island	3	7	8	18
Connecticut	0	0	2	2
New York	14~~14~~	13~~0~~	20~~19~~	47~~33~~

New Jersey	3	14	9	26
Delaware	0	1	3	4
Maryland	0	0	1	1
Virginia	0	2	4	6
North Carolina	1	0	2	3
Total	71~~71~~	108~~95~~	100~~99~~	279~~265~~

a. During 2004, the Northeast region had 37 seal strandings where species could not be determined. In 2004, 10 seals had signs of human interaction as a cause of death.

~~-~~ Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction

STATUS OF STOCK

The status of the gray seal population relative to OSP in U.S. Atlantic EEZ waters is unknown, but the populations appear to be increasing in Canadian and U.S. waters. The species is not listed as threatened or endangered under the Endangered Species Act. Recent data indicate that this population is increasing. The total fishery-related mortality and serious injury for this stock is believed to be very low relative to the population size in Canadian waters and can be considered insignificant and approaching zero mortality and serious injury rate. The level of human-caused mortality and serious injury in the U.S. Atlantic EEZ is unknown, but believed to be very low relative to the total stock size; therefore, this is not a strategic stock.

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~~November 2005~~~~January~~April 2006

HARP SEAL (*Phoca groenlandica*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The harp seal occurs throughout much of the North Atlantic and Arctic Oceans (Ronald and Healey 1981; Lavigne and Kovacs 1988); however, in recent years, numbers of sightings and strandings have been increasing off the east coast of the United States from Maine to New Jersey (Katona *et al.* 1993; Stevick and Fernald 1998; ~~B. Rubinstein, pers. comm., New England Aquarium;~~ McAlpine 1999; Lacoste and Stenson 2000, B. Rubinstein, pers. comm., New England Aquarium). These extralimital appearances usually occur in January-May (Harris *et al.* 2002), when the western North Atlantic stock of harp seals is at its most southern point of migration. Concomitantly, a southward shift in winter distribution off Newfoundland was observed during the mid-1990s, which was attributed to abnormal environmental conditions (Lacoste and Stenson 2000). The world's harp seal population is divided into three separate stocks, each identified with a specific breeding site (Bonner 1990; Lavigne and Kovacs 1988). The largest stock is located ~~in the western North Atlantic~~ off eastern Canada and is divided into two breeding herds which breed on the pack ice. The Front herd breeds off the coast of Newfoundland and Labrador, and the Gulf herd breeds near the Magdalen Islands in the middle of the Gulf of St. Lawrence (Sergeant 1965; Lavigne and Kovacs 1988). The second stock breeds in the White Sea off the coast of the Soviet Union, and the third stock breeds on the West Ice off eastern Greenland (Lavigne and Kovacs 1988). Harp seals are highly migratory (Sergeant 1965; Stenson and Sjare 1997). Breeding occurs at different times for each stock between mid-February and April. Adults then assemble north of their whelping patches to undergo the annual molt. The migration then continues north to Arctic summer feeding grounds. In late September, after a summer of feeding, nearly all adults and some of the immature animals migrate southward along the Labrador coast, usually reaching the entrance to the Gulf of St. Lawrence by early winter. There they split into two groups, one moving into the Gulf and the other remaining off the coast of Newfoundland.

The extreme southern limit of the harp seal's habitat extends into the U.S. Atlantic Exclusive Economic Zone (EEZ) during winter and spring. Support for the increase in numbers and geographic distribution of harp seals in New England to mid-Atlantic waters is based primarily on strandings, and secondarily on fishery bycatch (McAlpine and Walker 1990; Rubinstein 1994).

POPULATION SIZE

The total population size of harp seals is unknown; however, three seasonal abundance estimates are available which use a variety of methods including aerial surveys and mark-recapture (Table 1). Generally, these methods include surveying the whelping concentrations and modeling pup production. Harp seal pup production in the 1950's was estimated at 645,000 decreasing to 225,000 by 1970 (Sergeant 1975). Estimates began to increase at that time and have continued to rise through the late 1990s, reaching 478,000 in 1979 (Bowen and Sergeant 1983; Bowen and Sergeant 1985), 577,900 (CV=0.07) in 1990 (Stenson *et al.* 1993), 708,400 (CV=0.10) in 1994 (Stenson *et al*. 2002), and 998,000 (CV=0.10) in 1999 (Stenson *et al.* 2003~~0~~). The 2004 estimate of 991,000 (CV=0.06) indicates that the increase in pup production observed throughout the 1990s has likely stopped ~~i~~(Stenson *et al*. 2005).

Roff and Bowen (1983) developed an estimation model to provide a more precise estimate of total abundance. This technique incorporates recent pregnancy rates and estimates of age-specific hunting mortality (CAFSAC 1992). Shelton *et al.* (1992) applied a harp seal estimation model to the 1990 pup production and obtained an estimate of 3.1 million (range 2.7-3.5 million; Stenson 1993). Using a revised population model, 1994 pup count data, and two assumptions regarding pup mortality rates, Shelton *et al.* (1996) estimated pup production and total population size for the period 1955-1994. The 1994 total population estimate was 4.8 million (95% CI= 4.1-5.5 million) harp seals (Warren *et al.* 1997). ~~The 1999 population estimate was 5.2 million (95% CI=4.0-6.4 million) harp seals (Healey and Stenson 2000)~~ The revised 2000 population estimate was 5.5 million (95% CE= 4.5-6.4 million) harp seals (Healey and Stenson 2000; DFO 2005) (Table 1).

Table 1. Summary of abundance estimates (pups and total) for western North Atlantic harp seals. Year and area covered during each abundance survey, resulting abundance estimate (N_{best}) and coefficient of variation (CV).			
Month/Year	Area	N_{best}	CV
1999	Eastern-Atlantic Canada-Labrador	998,000 pups	+/- 2000,000 (95% CI)
~~1999~~ 2000	Eastern Atlantic Canada~~—~~Labrador	5.~~2~~ 5 million	(95% CI 4.5~~0~~-6.4 million)
2004	Eastern Atlantic Canada–Labrador	991,000 pups	(95% CI 0.9-1.1 million)
2004	Eastern Atlantic Canada-Labrador	5.9 million	(95% CI 4.6-7.2 million)

Minimum population estimate

Present data are insufficient to calculate the minimum population estimate for U.S. waters. It is estimated there are at least ~~5.2 million ("1.2 million)~~ (5.9 million ± 1.3 million) harp seals in Canada ~~(Healey and Stenson 2000).~~ (DFO 2005).

Current population trend

The population appears to be increasing in U.S. waters, judging from the increased number of stranded harp seals, but the magnitude of the suspected increase is unknown. In Canada, since 1996 the population has been stable ~~(5.2 million; "1.2 million)~~ (5.9 million ± 1.3 million) due to large harvests of young animals in recent years (Healey and Stenson 2000; DFO 2005). The 2004 pup production estimate suggests that the increase in pup production observed throughout the 1990s has likely stopped (Stenson *et al*. 2005).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The best data are based on Canadian studies. ~~Recent studies indicate that pup production has increased (Stenson *et al.* 2002, Stenson *et al.* 2003), but the rate of population increase cannot be quantified at this time (Stenson *et al.* 1996).~~ The mean age of sexual maturity was 5.8 yrs in the mid-1950s, declining to ~~4.6~~ 4.1 yrs in the early 1980s then increased to 5.3 yrs by the early 1990s and peaked at 5.7 years by 1995 (Sjare *et al.* 1996; Sjare and Stenson 2000; Sjare *et al* 2004). In 2001 the mean age was approximately 5.3 years (Sjare *et al*. 2004).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.12. This value is based on theoretical modeling showing that pinniped populations may not grow at rates much greater than 12% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size in U.S. waters is unknown. The maximum productivity rate is 0.12, the default value for pinnipeds. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) was set at 1.0 because it was believed that harp seals are within OSP. PBR for the western North Atlantic harp seal in U.S. waters is unknown. Applying the formula to the minimum population estimate for Canadian waters results in a "PBR" of ~~312,000~~ 354,000 harp seals. However, Johnston *et al.* (2000) suggests that catch statistics from the Canadian hunt are negatively biased due to under reporting; therefore, an F_R of 0.5 may be appropriate. Using the lower F_R results in a "PBR" of ~~156,000~~ 177,000 harp seals. The Canadian model predicts replacement yields between 522,000 and 541,000 (Healey and Stenson 2000).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

For the period ~~1999-2003,~~ 2000-2004 the total estimated annual human caused mortality and serious injury to harp seals was ~~453,962 472,039~~406,691. Estimated annual human caused mortality in US waters is ~~41~~86, derived from two components: 1) ~~36 80~~81 harp seals (CV=0.~~28~~29) ~~(CV=0.53)~~ from the observed U.S. fisheries (Table 2), and 2) 5 from average ~~1999-2003~~ 2000-2004 stranding mortalities resulting from human interactions (NMFS unpublished data). The remaining mortality is derived from five components: 1) ~~232,915 from to 1999-2003~~ 257,~~195~~280 from the 2000-2004 average commercial catches of northwest Atlantic harp seals by Canada (~~244,552 in 1999, 91,602~~92,055 in 2000, 226,493 in 2001, 312,367 in 2002, 289,512 in 2003, and ~~366,000~~365,971 in 2004) (Hammill and Stenson 2003, ~~Anon.~~DFO 2003~~a~~, DFO 2005; Stenson unpublished data); 2) ~~83,010 from 1999-2002 (2003 unavailable) ~75,891~~79,408 average Greenland subsistence catch ~~(97,583 in 1999,~~ 101,941 in 2000, ~~81,390~~89,617 in 2001, ~~51,124~~69,895 in 2002~~)~~, ~~~70,000~~68,499 in 2003, and ~~~70,000~~67,064 in 2004 (Anon~~.~~ymous 2003~~b~~, DFO 2005; Stenson unpublished data)), 3) ~~4,881~~566 average catches in the Canadian Arctic (~~4,881 in each year~~280 in 2000, 405 in 2001, 715 per year in 2002-2004) (Hammill and Stenson~~,~~ 2003; Stenson unpublished data), 4) ~~18,566 from 1999-2002 (2003 unavailable) 15,330 2000-2003 (2004 unavailable~~11,541 average bycatches in the Newfoundland lumpfish fishery (~~18,443 in 1999, 18,607~~11,323 in 2000, ~~18,607~~19,400 in 2001, ~~and 18,607~~9,329 in 2002~~; ~5,000~~, 5,367 in 2003, and 12,290 in 2004 (DFO 2005; Stenson unpublished data)), and 5) ~~119,430 from 1999-2002 118,657~~57,810 from 2000-~~2002~~ 2004 ~~(2003 and 2004 unavailable)~~ average struck and lost animals (animals that are killed but not recovered) (~~21,748 in 1999, 117,864~~58,873 in 2000, ~~109,313~~61,618 in 2001 and 1~~28,794~~ 57,495 in 2002, 53,285 in 2003, and 57,776 in 2004) (DFO 2005; Stenson unpublished data). The struck and lost component can be further broken down into struck and lost from the commercial harvest (~~20,902 average from 1999 to 2002 21,453~~17,825 from 2000-~~2002~~ 2004~~(2003 and 2004 unavailable)~~: ~~19,284 in 1999, 11,043~~7,762 in 2000, ~~23,042~~16,607 in 2001, and ~~30,275~~22,190 in 2002, 18,678 in 2003, and 23,887 in 2004), and struck and lost from the Canadian Arctic and Greenland harvests (~~87,890 average from 1999 to 2002; 83,032~~ 39,985 average from 2000-~~2002~~ 2004~~(2003 and 2004 unavailable)~~: ~~102,464 in 1999, 106,822~~51,111 in 2000, ~~86,271~~45,011 in 2001, and ~~56,005~~35,305 in 2002, 34,607 in 2003 and 33,889 in 2004) (DFO 2005; Stenson unpublished data). Struck and lost is calculated for the commercial harvest assuming that the rate is 5% for young of the year, and 50% for animals one year of age and older (~~Anon~~ DFO 2001, Stenson unpublished data). The Canadian Arctic and Greenland struck and lost rate is calculated assuming the rate is 50% for all age classes (~~Anon~~ DFO 2001; Stenson unpublished data).

Fishery Information

U.S.

Detailed fishery information is reported in the Appendix III.

Northeast Sink Gillnet:

There were ~~122~~ 137 harp seal mortalities observed in the Northeast sink gillnet fishery between 1990 and ~~2002~~ 2004. Annual estimates of harp seal bycatch in the Northeast sink gillnet fishery reflect seasonal distribution of the species and of fishing effort. Estimated annual mortalities (CV in parentheses) from this fishery during ~~1999-2003~~ 2000-2004 were: ~~81 in 1999 (0.78),~~ 24 in 2000 (1.57), 26 in 2001 (1.04), 0 during 2002-2003, and ~~15~~ 30~~0~~3(0.~~29~~30) in 2004 (Table 2). There were ~~1,~~ 5, 8, 2, ~~and~~ 2, and 9 unidentified seals observed during ~~1999~~ 2000 through ~~2003~~ 2004 respectively. Since 1997, unidentified seals have not been prorated to a species. This is consistent with the treatment of other unidentified mammals that do not get prorated to a specific species. Average annual estimated fishery-related mortality and serious injury to this stock attributable to this fishery during ~~1999-2003~~ 2000-2004 was ~~26~~ 71 harp seals (CV=0.29) (Table 2).~~(CV=0.60)~~ The stratification design used for this species is the same as that for harbor porpoise (Bravington and Bisack 1996). The bycatch occurred principally in winter (January-May) and was mainly in waters between Cape Ann and New Hampshire. One observed winter mortality was in waters south of Cape Cod.

Mid-Atlantic ~~Coastal~~ Gillnet:

No harp seals were taken in observed trips during 1993-1997, and 1999-2004~~2003~~. One harp seal was observed taken in 1998. Observed effort from ~~1993-2003~~ 1993-2004 was scattered between New York and North Carolina from 1 to 50 miles off the beach. All bycatches were documented during January to April. Using the observed takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 0 in 1995-1997, 17 in 1998 (1.02) and 0 in 1999-2004~~2003~~ In 2002, 65% of observer coverage was concentrated in one area and not distributed proportionally across the fishery. Therefore observed mortality is considered unknown in 2002. Average annual estimated fishery-related mortality attributable to this fishery during ~~1999-2003~~ 2000-2004 was zero harp seals.

North ~~Atlantic~~east Bottom Trawl

Vessels in the North Atlantic bottom trawl fishery, a Category III fishery under MMPA, were observed in order to meet fishery management needs, rather than marine mammal management needs. No mortalities were observed between 1991-2000, one mortality was observed in 2001, and zero mortalities were observed in 2002-2004. Observer coverage, expressed as number of trips, was < 1% from 1998 to 2001, ~~and~~ 2% in 2002, almost 3% in 2003 and over 4% in 2004 (Table 2). The estimated annual fishery-related mortality and serious injury attributable to this fishery (CV in parentheses) was 0 between 1991~~-~~ and 2000, 49 (CV=1.10) in 2001, and 0 between 2002~~-~~ and 2004~~2003~~. Average annual estimated fishery-related mortality attributable to this fishery ~~in~~ between ~~1999-2003~~ 2000- and 2004 was 10 harp seals (CV=1.10) (Table 2). ~~These estimates should be viewed with caution due to the extremely low (<1%) observer coverage.~~

~~**CANADA**~~

~~An unknown number of harp seals have been taken in Newfoundland and Labrador groundfish gillnets (Read 1994). Harp seals are being taken in Canadian lumpfish and groundfish gillnets and trawls, but estimates of total removals have not been calculated to date. A recent analysis of bycatch in the Newfoundland lumpfish fishery indicates that fewer than 10,000 seals were taken annually from the start of the fishery in 1968 until 1984 (Walsh *et al.* 2000). Between 1984 and 1995, annual bycatches were more variable, ranging between 3,000 and 36,000 animals. Since 1996, bycatches have varied between 16,000 and 23,000 seals (DFO 2000), averaging 17,000 annually (Walsh *et al.* 2000, DFO 2001).~~

~~In 1996, observers recorded 4 harp seals (1 released alive) in Spanish deep-water trawl fishing on the southern edge of the Grand Banks (NAFO Areas 3) (Lens 1997). Seal bycatches occurred year round, but interactions were highest during April-June. Many of the seals that died during fishing activities were unidentified. The proportion of sets with mortality (all seals) was 2.7 per 1,000 hauls (0.003).~~

Table 2. Summary of the incidental mortality of harp seal (*Phoca groenlandica*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [a]	Observer Coverage [b]	Observed Mortality [c]	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northeast Sink Gillnet	00-04	301	Obs. Data Weighout, Logbooks	.06, .04, .02, .06	3, 1, 0, 0, 15	24, 26, 0, 0, 30~~0~~3	1.57, 1.04, 0, 0, .~~29~~30	~~70~~71 (0.~~28~~29)
North ~~Atlantic~~east Bottom Trawl	00-04	TBD	Obs. Data Weighout	.004, .004, .021, .028 .045	0, 1, 0, 0, 0	0, 49, 0, 0, 0	0, 1, 10, 0, 0, 0	10 (1.10)
TOTAL								~~80~~81 (0.~~28~~29)

a. Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries ~~Science Center (NEFSC) Sea Sampling~~Observer Program. ~~NEFSC~~The Northeast Fisheries Observer Program collects landings data (Weighout) and total landings are used as a measure of total effort for the sink gillnet fishery. Mandatory logbook (Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast sink gillnet fishery.

b. The observer coverage for the Northeast sink gillnet fishery and the mid-Atlantic coastal sink gillnet fisheries are measured in tons of fish landed. North Atlantic bottom trawl fishery coverage is measured in trips.

c. Since 1998, takes from pingered and non-pingered nets within a marine mammal time/area closure that required pingers, and takes from pingered and non-pingered nets not within a marine mammal time/area closure were pooled. The pooled bycatch rate was weighted by the total number of samples taken from the stratum and used to estimate the mortality. In 2000 - 2004, respectively, 2, 1, 0, 0, 4 takes were observed in nets with pingers. In 2000 – 2004, respectively, 1, 0, 0, 0, 11 takes were observed in nets without pingers.

Other Mortality

~~**Canada:** Harp seals have been commercially hunted since the mid-1800's in the Canadian Atlantic (Stenson 1993). The total allowable catch (TAC) of harp seals in Canada has ranged from a low of 186,000 to a high of 350,000 between 1971 and 2003. Catches ranged from a low of 19,000 to a high of 312,367 over the same period. Low catches were reported between the years of 1983 and 1995 due to a limited market for seal products (Anon. 2003a). The Atlantic Seal Hunt 2003-2005 Management Plan (Anon.DFO 2003a) allows for a three-year TAC of 975,000, with an annual TAC of up to 350,00 any one or two of the years, provided that the combined TAC over three years does not exceed 975,000.~~

~~Harp seals are also hunted in the Canadian Arctic and in Greenland (DFO 2000). There are no recent statistics for the Canadian Arctic, but Hammill and Stenson (2003) estimated the Arctic catch to be 4,811 annually. Prior to 1980, Greenland catches were fewer than 20,000 annually, but in recent years have dramatically increased to around 100,000 (DFO 2000). These numbers do not account for animals that are killed but not landed (struck and lost) (Lavigne 1999). A recent analysis of the struck and lost rates suggests that the rate for young seals (majority of Canadian take) is less than 5%, while losses of older seals, and seals taken in the Canadian Arctic and Greenland, are higher (approximately 50%) (Anon. 2001). The Healy and Stenson (2000) model for determining harp seal population incorporates struck and lost and bycaught seals.~~

U.S. : From 1988 to 1993 strandings each year were under 50, approaching 100 animals in 1994, and exceeding 100 animals in 1995-1996 (Rubinstein 1994; B. Rubinstein, New England Aquarium, pers. comm.). From 1999 to ~~2003, 1,146~~ 2004, 1,482strandings were recorded (116 in 1999, 145 in 2000, 495 in 2001, 188 in 2002, ~~97~~ 101 in 2003, and 332 ~~in)~~ in 2004) in all states between Maine and North Carolina (NMFS unpublished data). Factors contributing to a dramatic increase in strandings in 2001 are unknown (Harris *et al.* 2002). Twenty-three ~~(2.0%)~~ (1.6%) of the stranded animals during this five- year period showed signs of human interaction as a direct cause of mortality. Mortalities caused by human interaction include boat strikes, fishing gear interactions, power plant entrainment, oil spills, harassment, and shooting.

The total number of harp seal strandings in ~~2003 is 97~~ 2004 was 332, of which 7 were healthy and did not require rehabilitation. ~~Seventeen~~ Sixteen animals were rehabilitated and released. The remaining animals were either found dead or died in rehabilitation.

Table 3. Harp seal (*Phoca groenlandica*) reported along the U.S. Atlantic coast (2002-2004).

State	2002	2003	2004[a]	Total
Maine	35	21	112	168
New Hampshire	1	1	2	4
Massachusetts	67	31	104	202
Rhode Island	10	6	14	30
Connecticut	12	1	2	15
New York	48	28~~4~~	66	142~~38~~
New Jersey	13	9	22	44
Delaware	0	1	5	6
Maryland	0	1	0	1

Virginia	1	0	4	5
North Carolina	1	2	1	4
Total	188	101~~97~~	332	621~~17~~
a. During 2004, one harp seal had signs of human interaction as the cause of mortality.				

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction

STATUS OF STOCK

The status of the harp seal stock, relative to OSP, in the U..S Atlantic EEZ is unknown, but the population appears not to be increasing in Canadian waters. The species is not listed as threatened or endangered under the Endangered Species Act. The total fishery-related mortality and serious injury for this stock is believed to be very low relative to the population size in Canadian waters and can be considered insignificant and approaching zero mortality and serious injury rate. The level of human-caused mortality and serious injury in the U.S. Atlantic EEZ is~~-~~ believed to be very low relative to the total stock size; therefore, this is not a strategic stock.

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HOODED SEAL (*Cystophora cristata*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The hooded seal occurs throughout much of the North Atlantic and Arctic Oceans (King 1983) preferring deeper water and occurring farther offshore than harp seals (Sergeant 1976a; Campbell 1987; Lavigne and Kovacs 1988; Stenson *et al.* 1996). Hooded seals tend to wander far out of their range and have been seen as far south as Puerto Rico (Mignucci-Giannoni and Odell 2001), with increased occurrences from Maine to Florida. These appearances usually occur between January and May in New England waters, and in summer and autumn off the southeast U.S. coast and in the Caribbean (McAlpine *et al.* 1999; Harris *et al.* 2001; Mignucci-Giannoni and Odell 2001). Although it is not known which stock these seals come from, it is known that during spring, the northwest Atlantic stock of hooded seals are at their southern~~-~~most point of migration in the Gulf of St. Lawrence. The world's hooded seal population is divided into three separate stocks, each identified with a specific breeding site (Lavigne and Kovacs 1988; ~~-~~Stenson *et al.* 1996). One stock, which whelps off the coast of eastern Canada, is divided into two breeding herds (Front and Gulf) which breed on the pack ice. The Front herd (largest) breeds off the coast of Newfoundland and Labrador and the Gulf herd breeds in the Gulf of St. Lawrence. The second stock breeds in the Davis Strait, and the third stock occurs on the West Ice off eastern Greenland.

Hooded seals are ~~a~~ highly migratory ~~species~~. Hooded seals remain on the Newfoundland continental shelf during winter/spring (Stenson *et al.* 1996). Breeding occurs at about the same time in March for each stock. Adults from all stocks then assemble in the Denmark Strait to molt between late June and August (King 1983; Anonymous 1995), and following this, the seals disperse widely. Some move south and west around the southern tip of Greenland, and then north along the west coast of Greenland. Others move to the east and north between Greenland and Svalbard during late summer and early fall (Lavigne and Kovacs 1988). Little else is known about the activities of hooded seals during the rest of the year until they assemble again in February for breeding.

POPULATION SIZE

The number of hooded seals in the western North Atlantic is unknown. Seasonal abundance estimates are available based on a variety of analytical methods based on commercial catch data, and also ~~includes~~ from aerial surveys. These methods often include surveying the whelping concentrations and modeling the pup production. Several estimates of pup production at the Front are available. Hooded seal pup production between 1966 and 1977 was estimated at 25,000 - 32,000 annually (Benjaminsen and Oritsland 1975; Sergeant 1976b; Lett 1977; Winters and Bergflodt 1978; Stenson *et al.* 1996). Estimated pup production dropped to 26,000 hooded seal pups in 1978 (Winters and Bergflodt 1978). Pup production estimates began to increase after 1978, reaching 62,000 (95% CI. 43,700 - 89,400) by 1984 (Bowen *et al.* 1987). Bowen *et al.* (1987) also estimated pup production in the Davis Strait at 18,600 (95% C.I. 14,000 - 23,000). A 1985 survey at the Front (Hay *et al.* 1985) produced an estimate of 61,400 (95% C.I. 16,500 - 119,450). Hammill *et al.* (1992) estimated pup production to be 82,000 (SE=12,636) in 1990. Assuming a ratio of pups to total population of 1:5, pup production in the Gulf and Front herds would represent a total population of approximately 400,000-450,000 hooded seals (Stenson 1993). Based on the 1990 survey, Stenson *et al.* (1996) suggested that pup production may have increased at about 5% per year since 1984. However, because of exchange between the Front and the Davis Strait stocks, the possibility of a stable or slightly declining level of pup production is also likely (Stenson 1993; Stenson *et al.* 1996). In 1998 and 1999, surveys were conducted to estimate pup production in the southern Gulf of St. Lawrence, which is the smallest component of the northwest Atlantic stock (Anonymous 2001). The estimate of 2,000 was similar to the previous published 1990 estimate (Hammill *et al.* 1992; Anonymous 2001). There are no current estimates of pup production for the Davis Strait or the Front breeding groups. The stock has not been surveyed since 1990, but a pup survey was ~~planned for~~ conducted in March 2005 (~~Anonymous~~Stenson pers. comm.).~~Anon 2003).~~

Minimum population estimate

Present data are insufficient to calculate the minimum population estimate for U.S. waters. Since there are no recent comprehensive pup production counts it is not possible to assess current population size (Anonymous 2001).

Current population trend

There are no current data to assess the status of the population in either Canadian or U.S. waters.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The most appropriate data are based on Canadian studies. The most recent comprehensive pup production survey (1990) is nearly 13 years old, which exceeds the GAMMS (Wade and Angliss 1997) criterion (e.g., >8 years) for reliable abundance data.

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.12. This value is based on theoretical modeling showing that pinniped populations may not grow at rates much greater than 12% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is unknown. The maximum productivity rate is 0.12, the default value for pinnipeds. The recovery factor (F_R) for this stock is 0.5, the value for stocks with unknown population status. PBR for the western North Atlantic hooded seal in U.S. waters is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

For the period ~~1999-2003~~ 2000-2004, the total estimated human caused mortality and serious injury to hooded seals was 6,139~~5,594~~. This is derived from two components: 1) ~~5,578 from 1999-2003 (1999 = 3,375;~~ 6,114 from 2000-2004 (2000 = 5,988; 2001 6,414; 2002 = 6,056[1]~~; and~~ ; 2003 = 6,056[1], and 2004 = 6,056[1]) average catches of Northwest Atlantic population of hooded seals by Canada and Greenland; and 2) ~~16~~ 25 hooded seals ~~(CV=1.14)~~ (CV=0.82) from the observed U.S. fisheries (Table 1) ~~([1] 2000-2001 average Greenland catches)].~~

~~In 1974 total allowable catch (TAC) was set at 15,000, and reduced to 12,000 in 1983 and to 2,340 in 1984 (Stenson 1993; Anonymous 1998). From 1991-1992 the TAC was increased to 15,000. A TAC of 8,000 was set for 1993, and held at that level through 1997. Since 1998, the TAC has been set at 10,000 (Anonymous 2003). From 1974 through 1982, the average catch was 12,800 animals, mainly pups. Since 1983 catches ranged from 33 in 1986 to 6,425 in 1991, with a mean catch of 1,001 between 1983 and 1995. In 1996 catches (25,754) were more than three times the allowable quota (Anonymous 1998). The high catch was attributable to good ice conditions and strong market demand. Catches in 1997 were 7,058, slightly below the TAC. Since 2000, catches in have ranged between 5,000-6,000 animals (Anonymous 2003).~~

~~Hunting in the Gulf of St. Lawrence (below 50° N) has been prohibited since 1964. No commercial hunting of hooded seals is permitted in the Davis Strait.~~

~~Total annual estimated average fishery-related mortality or serious injury to this stock in U.S. waters during 1999-2003 was 16 hooded seals (CV=1.14; Table 1).~~

Fishery Information

Detailed fishery information ~~are~~ is reported in Appendix III.

U.S.

Northeast Sink Gillnet

The fishery has been observed in the Gulf of Maine and in southern New England. There were 2 hooded seal mortalities observed in the Northeast sink gillnet fishery between 1990 and ~~2003~~2004. Annual estimates of hooded seal bycatch in the Northeast sink gillnet fishery reflect seasonal distribution of the species and of fishing effort. Estimated annual mortalities (CV in parentheses) from this fishery during 1990-2003 were 0 in 1990-1994, 28 in 1995 (0.96), 0 in 1996-2000, 82 in 2001 (1.14), ~~and~~ 0 in 2002-2003, and ~~46~~43 (0.~~93~~95) in 2004. The 1995 bycatch includes 5 animals from the estimated number of unknown seals (based on observed mortalities of seals that could not be identified to species). The unknown seals were prorated, based on spatial/temporal patterns of bycatch of harbor seals, gray seals, harp seals, and hooded seals. There were ~~1,~~ 5, 8, 2, ~~and~~ 2, and 9 unidentified seals observed during 2000-2004, ~~1999-2003,~~ respectively. Since 1997, unidentified seals have not been prorated to a species. This is consistent with the treatment of other unidentified mammals that do not get prorated to a specific species. Average annual estimated fishery-related mortality and

[1] 2000-2001 average Greenland catches.

serious injury to this stock attributable to this fishery during ~~1999-2003~~2000-2004 was ~~26~~25 hooded seals (CV=0.~~80~~82) (Table 1).~~1999-2003was 16 hooded seals (CV=1.14).~~ The stratification design used is the same as that for harbor porpoise (Bravington and Bisack 1996). The bycatch in 2001 occurred in summer (July-September). All bycatch was in waters between Cape Ann and New Hampshire.

CANADA

An unknown number of hooded seals have been taken in Newfoundland and Labrador groundfish gillnets (Read 1994).

Hooded seals are being taken in Canadian lumpfish and groundfish gillnets and trawls; however, estimates of total removals have not been calculated to date.

Table 1. Summary of the incidental mortality of hooded seal (*Cystophora cristata*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type[a]	Observer Coverage[b]	Observed Mortality[c]	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northeast Sink Gillnet	~~99-03~~00-04	301	Obs. Data Weighout, Logbooks	~~.06,~~.06, .04, 02, .03, .06	~~0,~~ 0, 1, 0, 0, 1	~~0,~~ 0, 82, 0, 0, 43	~~0,~~ 0, 1.14, 0, 0, .95	~~16 (1.14)~~~~26~~25 (0.8~~0~~2)
TOTAL								~~16 (1.14)~~~~26~~ 25 (0.~~80~~82)

a. Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center ~~(NEFSC) Sea Sampling~~Observer Program. NEFSC collects Weighout (Weighout) landings data, and total landings are used as a measure of total effort for the sink gillnet fishery. Mandatory logbook (Logbook) data are used to determine the spatial distribution of some fishing effort in the Northeast sink gillnet fishery.

b. The observer coverage for the Northeast sink gillnet fishery is measured in ~~trips.~~tons of fish landed.

c. Only mortalities observed on marine mammal trips were used to estimate total hooded seal bycatch. See Bisack (1997) for "trip" type definitions. The one hooded seal mortality observed in 2001 was taken in a net equipped with pingers. The one hooded seal mortality observed in 2004 was taken in a net not equipped with pingers.

Other Mortality

In Atlantic Canada, hooded seals have been commercially hunted at the Front since the late 1800's. In 1974 total allowable catch (TAC) was set at 15,000, and reduced to 12,000 in 1983 and to 2,340 in 1984 (Stenson 1993; Anonymous 1998). From 1991 to 1992 the TAC was increased to 15,000. A TAC of 8,000 was set for 1993, and held at that level through 1997. From 1974 through 1982, the average catch was 12,800 animals, mainly pups. Since 1983 catches ranged from 33 in 1986 to 6,425 in 1991, with a mean catch of 1,001 between 1983 and 1995. In 1996 catches (25,754) were more than three times the allowable quota (Anonymous 1998). The high catch was attributable to good ice conditions and strong market demand. The TAC has remained at 10,000 since 1998 but catches have been very low (e.g., 10 (2000) and 151 (2003); DFO 2001; Anonymous 2003; Stenson, unpublished data). Greenland catches remained below 5,000 during the period 1954-1975, but increased to 5,000-7,000 and 6,300-9,900, respectively, during the periods 1976-1992 and 1993-1998 (Anonymous 2001). A series of management regulations have been implemented since 1960. For example, hunting in the Gulf of St. Lawrence (below 50°N) has been prohibited since 1965, no commercial hunting of hooded seals is permitted in the Davis Strait, and in 2000, the taking of bluebacks was prohibited (Anonymous 2001).

In 1988-1993, strandings were fewer than 20 per year, and from 1994 to 1996 they increased to about 50 per year (Rubinstein 1994; Rubinstein, pers. comm~~). From 1999 to 2003, 200 hooded seal strandings were reported (1999=36; 2000=30, 2001=86, 2002=30, and 2003=18), in most states from Maine to Virginia (Table 2; NMFS unpublished data).~~ From 2000 to 2004, 207 hooded seal strandings were reported (2000=30, 2001=86, 2002=30, 2003=20, and 2004=41), in most states from Maine to Virginia (Table 2; NMFS unpublished data). Three (1.5%) of the seals stranded during this five year period showed signs of human interaction as a direct cause of mortality, (1 in 1999, 1 in 2000, and 1 in 2003). Extralimital strandings have also been reported off the southeast U.S., North Carolina to Florida, and in the Caribbean (McAlpine *et al.* 1999; Mignucci-Giannoni and Odell 2001; NMFS, unpublished data).

~~STATE~~	~~2002~~	~~2003~~	~~TOTAL~~
~~Maine~~	~~14~~	~~10~~	~~24~~
~~New Hampshire~~	~~1~~	~~1~~	~~2~~
~~Massachusetts~~	~~10~~	~~4~~	~~14~~
~~Rhode Island~~	~~0~~	~~0~~	~~0~~
~~Connecticut~~	~~0~~	~~0~~	~~0~~
~~New York~~	~~2~~	~~2~~	~~4~~
~~New Jersey~~	~~2~~	~~2~~	~~4~~
~~Delaware~~	~~1~~	~~1~~	~~2~~
~~Total~~	~~30~~	~~20~~	~~50~~

Table 2. Hooded seal (*Cystophora cristata*) reported strandings along the U.S. Atlantic coast (2002-~~2003).~~2004).

State	**2002**	**2003**	**2004**[a]	**Total**
Maine	14	10	15	39
New Hampshire	1	1	2	4
Massachusetts	10	4	13	27
Rhode Island	0	0	0	0
Connecticut	0	0	0	0
New York	2	2~~0~~	5~~4~~	9~~6~~
New Jersey	2	2	2	6
Delaware	1	1	3	5
Maryland	0	0	1	1
Virginia	0	0	0	0
Total	30	20~~18~~	41~~0~~	91~~88~~

a. During 2004, the Northeast region had 37 seal strandings where species could not be determined.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

STATUS OF STOCK

The status of hooded seals relative to OSP in U.S. Atlantic EEZ is unknown, but the population appears to be increasing in Canada. They are not listed as threatened or endangered under the Endangered Species Act. The total fishery-related mortality and serious injury for this stock is believed to be very low relative to the population size in Canadian waters and can be considered insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because the level of human-caused mortality and serious injury is believed to be very low relative to overall stock size.

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